U. S. Government

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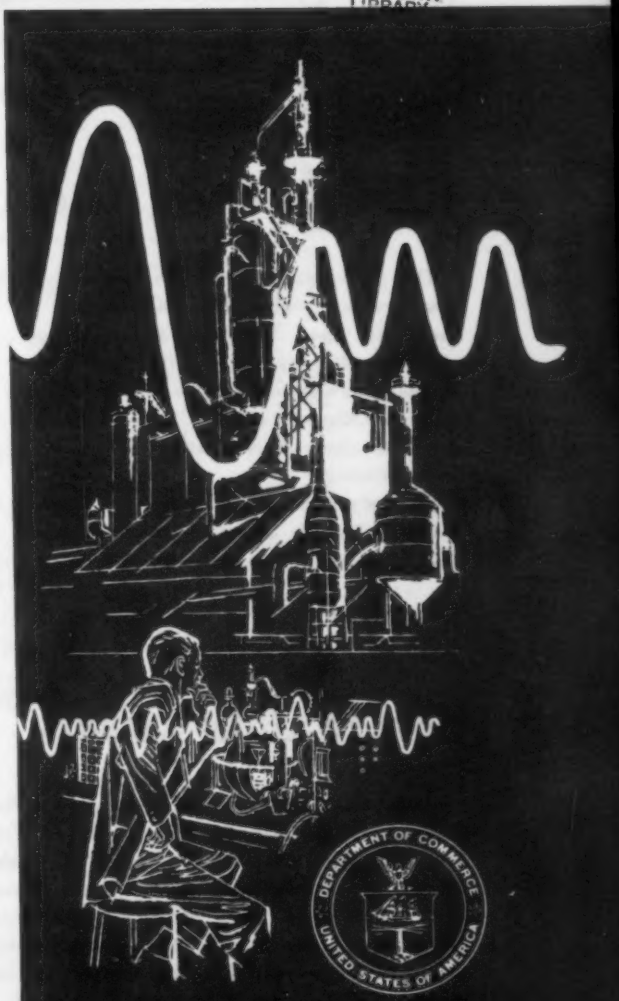

U. S. DEPARTMENT OF COMMERCE

BUSINESS AND DEFENSE SERVICES ADMINISTRATION

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U.S. GOVERNMENT RESEARCH REPORTS

U.S. DEPARTMENT OF COMMERCE
Luther H. Hodges, *Secretary*

BUSINESS AND DEFENSE SERVICES ADMINISTRATION

Office of Technical Services
John C. Green, *Director*

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Use of funds for printing this publication approved by the Director of the Bureau of the Budget, July 18, 1958

U.S. Government Research Reports

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TECHNICAL ABSTRACT BULLETIN

1. AIRCRAFT AND FLIGHT EQUIPMENT

AD-268 173 Div. 1
(TISTA/VGW) OTS price $5.60

Research, Inc., Minneapolis, Minn.
CABLE AND PISTON DRAG PARAMETER INVESTIGATION FOR HYDRAULIC AIRCRAFT-ARRESTING ENERGY ABSORBERS,
by Howard L. Peterson. June 61, 46p. incl. illus. tables.
(Contract AF33(600)40364, Proj. 6073)
(ASD TN 61-65) Unclassified report

DESCRIPTORS: (*Arresting gear for Airplane landings.) (Hydraulic systems, Effectiveness for Runways, Wire, Safety devices, Tests.)

An investigation was conducted to obtain information on the parameters affecting operation or control of hydraulic energy absorbers used in barrier systems. The influence of independent variables on cable drag was investigated by pulling a test cable (wire rope) through a water filled tube at velocities up to 200 feet per second. Drag forces and tube water pressures were recorded for various test configurations. The variables included water tube length and diameter, smooth and rough test cable and varying amounts of water bleed. Results were analyzed and compared with full scale barrier tests. The variation of piston drag with tube diameter was also investigated. Results, using both single and double piston arrangement were compared to the full scale barrier tests. (Author)

AD-268 183 Div. 1, 9
(TISTA/WAW) OTS price $5.60

Shin Meiwa Industry Co., Ltd. (Japan).
TOWING TANK TESTS OF THE UF-2 SEAPLANE. THE ORIGINAL HULL AND ITS MODIFICATIONS. VOLUME I. SPRAY CHARACTERISTICS.
31 July 61, 55p. incl. illus. tables.
(Subcontract to Grumman Aircraft Engineering Corp., Bethpage, N. Y., Contract NOw-60-0460-f)
Unclassified report

DESCRIPTORS: (Flying boats, Seaplanes, *Flying boat hulls, *Hydrodynamics, *Flying boat spray, Seaplane spray, Reduction, Take-off, Airplane landings, Model tests.)

The results are described of the towing tank tests concerning the spray characteristics of 8% UF-2 hull model and its modification performed in Japan. The object of the test was to find an effective method to minimize the water spray on the hull of the UF-2 flying boat generated during take-off and landing. Three new wooden 8% models were manufactured for the present test: one original UF-2 and the other two modified by the groove type spray suppressor and with spray dam. (Author)

AD-268 260 Div. 1, 12
(TISTA/WAW) OTS price $1.50

National Engineering Science Co., Pasadena, Calif.
ASPECTS OF THE RESPONSE OF STRUCTURES SUBJECT TO SONIC FATIGUE.
Rept. for May 60-Mar 61, on Dynamic Problems in Flight Vehicles,
by Hassel C. Schjelderup and Arnold E. Galef.
July 61, 43p. incl. illus. tables, 10 refs.
(Contract AF 33(616)7341, Proj. 13456)
(WADD TR 61-187) Unclassified report

DESCRIPTORS: (Airplanes, Rockets, Guided missiles, Space probes, Satellite vehicles, *Airframes, Stresses, Deformation, Fatigue (Mechanics), Life expectancy, *Acoustics, Noise, Jet engine noise, Rocket motor noise, Mathematical analysis, Tests, Measurement, Probability, Nomographs.)

The stress in aircraft structure resulting from multi-mode response to sonic excitation is resolved into an alternating stress component superimposed upon a slowly varying mean stress component. It is then found that the probability distribution of those components is nearly independent of the number of modes participating in the response. This finding could have considerable application in simplifying fatigue analysis and testing if it may be shown that the mean stress component has only low order effects upon fatigue life. Some of the possible applications are presented. A test program for establishing the significance of the mean stress component is outlined. (Author)

AD-268 273 Div. 1
(TISTA/WAW) OTS price $3.60

Bell Helicopter Corp., Fort Worth, Tex.
AN EVALUATION OF A GRID ENCODEMENT OF THE GROUND PLANE AS A HELICOPTER HOVERING DISPLAY.
Rept. on ANIP.,
by L. E. Wilkerson and W. G. Matheny. Oct 61, 28p. incl. illus. tables, 7 refs. (Rept. no. D228-421-008)
(Contract Nonr-167000)
Unclassified report

DESCRIPTORS: (*Helicopters, All weather aviation, *Flight attitude indicators, *Flight position indicators, *Flight instruments, Display systems, Simulation, Flight simulators, Analog systems, Human engineering, Flight testing, Tests.)

A study was undertaken to determine the effectiveness of the contact analog display when used as a hovering display for the helicopter. Ten helicopter pilots were tested on the analog display and under contact conditions. Contact in this study was defined as being a real world view of the same visual angle as was represented by the analog display. Upon completion of their test trials on the analog display, all subjects lifted the helicopter off to a hover and landed

unassisted while using the grid perspective display. Data were collected on the pilots' ability to hold altitude, heading, and deviations in fore-and-aft and laterally from a point on the ground. Experienced subjects as well as relatively inexperienced subjects were able to lift the helicopter from the ground, hover it and return it to the landing position, unaided, through use of the analog display. It was also found that experienced pilots could incorporate and use at least one of the six dimensions of required information when this dimension (altitude) is not encoded as a direct analog of the real world perspective view. (Author)

AD-268 342 Div. 1, 9
(TISTA/WAW) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
INCIPIENT- AND DEVELOPED-SPIN AND RECOVERY CHARACTERISTICS OF A MODERN HIGH-SPEED FIGHTER DESIGN WITH LOW ASPECT RATIO AS DETERMINED FROM DYNAMIC-MODEL TESTS.
by Henry A. Lee, and Charles E. Libbey. Dec 61, 22p. incl. illus. tables (NASA Technical note D-956)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-956.

DESCRIPTORS: (*Jet fighters, Jet planes, Supersonic planes, *Aerodynamics, Model tests, Wind tunnel models.) (Spin, *Stability, Recovery, Parachutes, Control surfaces, Measurement, Effectiveness.)

Incipient- and developed-spin and recovery characteristics of a modern high-speed fighter design with low aspect ratio were investigated by dynamic model tests. A 1/7-scale radio-controlled model was tested by drop tests from a helicopter. Several 1/25-scale models with various configuration changes were tested in the Langley 20-foot free-spinning tunnel. Model results indicated that generally it would be difficult to obtain a developed spin with a corresponding airplane and that either the airplane would recover of its own accord from any poststall motion or the poststall motion could be readily terminated by proper control technique. On occasion, results indicated that if a poststall motion were allowed to continue, a fully developed spin might be obtainable from which recovery could range from rapid to no recovery. Satisfactory recoveries could be obtained with a proper-size tail parachute or strake, application of pitching-, rolling-, or yawing-moment rockets, or differential deflection of the horizontal tail. (Author)

AD-268 350 Div. 1, 9
(TISTA/WAW) OTS price $12.00

Princeton U., N. J.
AN ANALYTICAL STUDY OF THE LONGITUDINAL DYNAMICS OF A TILT-WING VTOL,
by Charles R. Hargraves. June 61, 164p. incl. illus. tables, 21 refs. (Rept. no. 561)
(Contract DA 44-177-tc-524, Proj. 9-38-01-000, TK902)
Unclassified report

DESCRIPTORS: (*Vertical take-off planes, *Convertible airplanes, Stability, *Stability (Longitudinal), Mathematical analysis, Mathematical prediction, Differential equations, Partial differential equations, Integral equations.)

An analysis of the stability characteristics of a tilt-wing VTOL aircraft is made. The stability derivatives associated with the wing-rotor combination are estimated on the basis of the assumption that for the purpose of stability analysis, the forces acting on the wing in the slipstream can be assumed to depend on the vector sum of the free-stream velocity and the induced velocity of the rotor. The wing derivatives are presented in the form of general charts which can be used for the evaluation of the derivatives for any wing-rotor combination. Numerical calculations are made for a typical tilt-wing VTOL (the Vertol 76) transition. A curve is obtained showing the variation of the stability characteristics with wing tilt angle. An extensive discussion is given concerning the effects of important physical parameters on values of the derivatives and of the effect of these derivatives on the stability characteristics of the aircraft. (Author)

AD-268 378 Div. 1
(TISTA/WAW) OTS price $2.75

American Machine and Foundry Co., Niles, Ill.
AN INVESTIGATION OF TWO METHODS OF ARRESTMENT OF HIGH-SPEED AIRCRAFT,
by Donald F. Hausknecht and Ramojus P. Vaitys. Sep 61, 131p. incl. illus. tables, 3 refs.
(Contract AF 33(616)7152, Proj. MR 1135-90)
(ASD TN 61-128) Unclassified report

DESCRIPTORS: Jet planes, Supersonic planes, Airplane landings, *Arresting gear, Design, Mathematical analysis, *Wire, Elasticity, Differential equations, Partial differential equations, Integral equations.

Two methods of aircraft arrestment are investigated to determine their suitability for aircraft landing speeds far above the capabilities of present systems. One method is preacceleration of components of a present arresting system to reduce the relative impact velocity between the aircraft and preaccelerated components. Energy requirements and tolerances affecting timing of the preacceleration are investigated and illustrated with numerical examples. The other method is the use of an energy-absorbing material in the cable of an arresting system to obviate a separate arresting engine. Basic formulas for interactions of waves in a yielding cable are developed. The formulas are applied in numerical examples for specific arrangements of the cable. Results indicate that both methods offer sufficient promise of success to be worthy of development. (Author)

AD-268 510 Div. 1
(TISTA/VGW) OTS price $1.60

North American Aviation, Inc., Los Angeles, Calif.
EMERGENCY AND ESCAPE PROCEDURES,
by James F. Hegenwald, Jr. and Dean W. Brown. 1960, 18p. incl. illus. 3 refs. (Rept. no. NA 60-814)
Unclassified report

Presented at the Physiological Training Officer Symposium School of Aviation Medicine, Brooks Air Force Base, Texas, 13-17 June 1960.

DESCRIPTORS: (Aviation safety, Aviation personnel, *Ejection seats, Catapults, Pilot seats, *Pressure suits, Jettisonable cockpits, Human engineering, Design, Theory, Military requirements.) (Pilots, Separation from Ejection seats.) (Spaceships, Launching, Space flight, Hazards.)

Methods are discussed by which escape devices designed fifteen or more years ago, may be considerably improved. Then, the ejection seat-pressure suit combination of a research aircraft is described, followed by a report concerning the encapsulated seatof a Mach 3 air vehicle and a brief examination of the aspects of escape from space vehicles. (Author)

AD-268 511 Div. 1
(TISTA/VGW) OTS price $2.60

North American Aviation, Inc., Los Angeles, Calif.
AERIAL AND SLED TESTING OF THE B-70 AIRCREW ESCAPE CAPSULE.
1961, 23p. incl. illus. (Rept. no. NA 60-1133)
Unclassified report

For presentation at the Annual Symposium of the Society of Experimental Test Pilots at Los Angeles, California, 6-8 October 1960 and Supplemented for the Physiological Training Officer Symposium School of Aviation Medicine Brooks Air Force Base, Texas, 6-10 February 1961.

DESCRIPTORS: (Jet bombers, Supersonic planes, Ejection seats, *Jettisonable cockpits, Flight testing, Parachute descents, Ejection from Rocket propelled sleds, Tests, Aerodynamics, Stability, Effectiveness.) (Test facilities, Test methods for Simulation of Ejection, Bailout.)

Aerial and sled ejection tests are described wherein the B-70 escape capsule has passed or favorably exceeded specification in the following categories: (1) parachute deployment through complete range of indicated airspeeds. (2) rate of descent; (3) low altitude airdrops of capsule; (4) 20,000 and 40,000 ft airdrops of capsule; and (5) safe escape at ground level at airspeeds of 90 knots through maximum. Remaining to be tested are performance at high Mach number and high dynamic pressure, with continued development in the areas of ground and water impact and environmental control. (Author)

AD-268 573 Div. 1
(TISTA/SEB) OTS price $2.60

Beech Aircraft Corp., Wichita, Kans.
PROTOTYPE DEVELOPMENT MODEL 385 AIR REFUELING STORE.
Interim rept. no. 18, 1-30 Nov 61,
by C. V. Lassmann. 8 Dec 61, 6p. illus. table.
(Engineering rept. no. 4270)
(Contract NOw 60-0060-c)
Unclassified report

DESCRIPTORS: (Naval aircraft, Jet fighters, Transport planes, *Airplane refueling, Refueling in flight.) (Airplane protuberances, Airplane noses, Booms, Structures, Manufacturing methods, Design, Tests.)

Development of the Beech Model 385 Air Refueling Store continued. The first prototype unit is in its final assembly phase, and testing of a complete mock-up of the fuel system is in process. A structural deficiency in the turbine clutch became apparent and is being corrected by the clutch manufacturer. (Author)

AD-268 574 Div. 1
(TISTA/VGW) OTS price $6.60

Battelle Memorial Inst., Columbus, Ohio.
A STUDY OF RELIABILITY OF FLIGHT-VEHICLE FIRE-PROTECTIVE EQUIPMENT.
Rept. for 10 Nov 60-30 Apr 61,
by H. Cary, J. L. Easterday, and others. Sep 61, 63p. incl. illus. table, 5 refs.
(Contract AF 33(616)7306, Proj. 6075)
(ASD TR 61-65) Unclassified report

Original contains color plates; all ASTIA reproductions will be in black and white. Original may be seen in ASTIA Hq.

DESCRIPTORS: (Aviation safety, *Aircraft fires, Hazards, Detection, Countermeasures, *Fire detectors, *Fire extinguishers, Theory, Design, Effectiveness, Reliability.)

An analysis was initiated of existing fire-detection and extinguishing systems to determine deficiencies from a reliability standpoint, and determine design criteria to insure high reliability for use in flight vehicles. A field survey and data analysis were performed and reported on in Phase I of this contract. Since it was concluded that a lack of systems approach was the main contribution to unreliable equipment, this report delineates an integrated program for achieving reliable fire protection for a flight vehicle. Fire hazards must be identified during a design and hazard study of the preliminary weapon-system design. Materials characteristics must be assessed and a fire-hazard index estimated. The risks of using or not using a fire-protection system must be studied. A technique for justifying the use of fire-protection equipment is described, as is a means of optimizing fire-detection characteristics. (Author)

AD-268 585 Div. 1, 13
(TISTE/NTM) OTS price $1.60

Fenwal, Inc., Ashland, Mass.
LIGHT WEIGHT FIRE EXTINGUISHING SYSTEM.
Interim bi-monthly progress rept. no. 6, 1 Oct-1 Dec 61,
by Parker Peterson. 1 Dec 61, 5p. illus.
(Contract NOw 61-0243-c)
Unclassified report

DESCRIPTORS: (*Fire extinguishers, Aircraft equipment, Airborne, Design, Tests, Manufacturing methods, Military requirements.) (*Gas generating systems, Propellants, Design, Materials, Aluminum, Valves, Pipes, Pipe fittings.) (*Aircraft fires, Fires, Chemicals, Storage.)

Progress is presented on the design of a light weight fire extinguishing system. Functional evaluation of the single-shot system configuration was completed. Prototype crossover valves are undergoing environmental testing. Preliminary manufacturing drawings of all components were prepared. System tare weights were compiled and in many cases the weight saving will exceed the target figure of 50%. (Author)

Division 1 - AIRCRAFT AND FLIGHT EQUIPMENT

AD-268 619 Div. 1
(TISTA/LSK) OTS price $2.00

Research, Inc., Minneapolis, Minn.
DEVELOPMENT AND TESTING OF AN INFLATABLE CABLE SUPPORT SYSTEM FOR AIRCRAFT ARRESTING EQUIPMENT.
Rept. on Aircraft Arresting Barriers,
by K. M. Lang. Aug 61, 66p. incl. illus. tables.
(Contract AF 33(600)40364, Proj. 6073)
(ASD TN 61-108) Unclassified report

DESCRIPTORS: (Runways, Airplane landings, Pneumatic devices, Cable supports for *Arresting gear, Wire, Design, Tests, Effectiveness.)

An inflatable cable support system was designed, developed and tested for the purpose of holding an arresting barrier cable above a runway so that hook equipped aircraft can properly engage the cable in emergency situations during landing or take-off. The system consists essentially of an air supply controls system, a buried manifold line extending across the runway and a number of inflatable supports installed flush at regular intervals along the manifold line. This report describes the development of an inflatable support unit rugged enough to withstand the repeated abuse of aircraft rollovers and the development of an inflation system which permits rapid raising and lowering of the arresting cable. Tests conducted at Edwards Air Force Base showed that the inflatable cable support concept is entirely feasible for arresting hook equipped aircraft. (Author)

AD-268 665 Div. 1, 16
(TISTB/LH) OTS price $1.60

Air Force Flight Test Center, Edwards Air Force Base, Calif.
BIOASTRONAUTICS SUPPORT OF THE X-15 PROGRAM,
by Burt Rowen. Dec 61, 8p. incl. illus. (Rept. no. FTC TDR 61-61)
Unclassified report

DESCRIPTORS: (*Pressure suits, *Flight clothing, *Human engineering, Design, Test methods.) (Physiology, Stress (Physiology), Stress (Psychology), Radiation effects, Detectors, *Recording devices.) (Research planes, Hypervelocity vehicles.) *Astronautics.

One objective of the X-15 program is to obtain the pilot's physiological response to flight at increased speed and altitude. This objective is accomplished with the pilot wearing the new A/P 22S-2 full pressure suit in eighteen X-15 operations. The suits were evaluated for a flight time of 171 hr and a ground time of 554 hr. The A/P 22S-2 has major improvements over the original MC-2 full pressure suit with respect to increased visual area, ease of donning, and removability of gloves. A new system of electrical connections was installed through a pressure seal to facilitate data acquisition and to void the older snap pad arrangement used in the MC-2 suit. Flight test data showed that the continuous electrical lead has greatly increased reliability in data acquisition.

AD-268 697 Div. 1
(TISTW/DLW) OTS price $12.00

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
USES FOR ANGLE OF ATTACK AS A FLIGHT CONTROL INSTRUMENT.
Master's thesis,
by Willard Ellsworth Wilvert. Mar 61, 151p. incl. illus. tables, 66 refs. (Rept. no. GAE-61(52)SP)
Unclassified report

DESCRIPTORS: (*Angle of attack indicators, Flight instruments, Display systems, Calibration, Human engineering, Effectiveness, Reliability, Tests.) Theses.

Literature is reviewed on the angle of attack sensor and display development. The use of angle of attack information in various phases with present and probable future weapon systems is emphasized. Attempts to improve the sensor and display of angle of attack information are described. With regard to mechanization and sensing, progress is reported in the various techniques used. An assessment is made of the present status of sensing techniques. Particular emphasis is placed upon present functional angle of attack devices in use, as well as those which are to be evaluated experimentally for possible use on advanced aerospace vehicles. (Author)

AD-268 797 Div. 1
(TISTA/LSK) OTS price $1.10

School of Aerospace Medicine, Brooks Air Force Base, Tex.
AUTOMATIC ESCAPE SYSTEMS OF CURRENT USAF AIRCRAFT,
by Louis F. Johnson, Jr. Aug 61, 7p. 21 refs. (Review no. 9-61)
Unclassified report

DESCRIPTORS: (Jet fighters, Pilots, Bailout, *Ejection seats, Automatic, Design.)

Characteristics of the different sections of automatic escape systems are compared. It is seen that in using a fast system (i.e., the M-12 lapbelt initiator, zero lanyard, and the B-4, C-9 parachute) there is a considerable time advantage over using a slower system. This time advantage can be meaningfully transposed into altitude and shows that a fast system will allow successful escape at a lower altitude than will a slower system. (Author)

AD-268 839 Div. 1, 9
(TISTA/VGW) OTS price $1.25

National Aeronautics and Space Administration, Washington, D. C.
AERODYNAMIC CHARACTERISTICS OF A POWERED SEMISPAN TILTING-SHROUDED-PROPELLER VTOL MODEL IN HOVERING AND TRANSITION FLIGHT,
by Kenneth W. Goodson and Kalman J. Grunwald. Jan 62, 46p. incl. illus. table, 8 refs. (NASA Technical note D-981)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-981.

DESCRIPTORS: (Aerodynamics, Semispan, *Shrouded propellers for Vertical take-off planes, Wind tunnel models, Model tests, Tests of Stability (Longitudinal), Pitch, Moments, Control)

An investigation of aerodynamic characteristics of a powered semispan tilting-shrouded-propeller configuration was conducted in the 17-foot test

section of the Langley 300-MPH 7- by 10-foot tunnel. The wing had an aspect ratio of 2.67 (based on wing span of 60 inches), a taper ratio of 0.67, and an NACA 2418 airfoil section with a 15-inch-diameter shrouded propeller mounted on the tip. Results show that large nose-up pitching moments are obtained at transitional speeds of about 40 knots and duct angle of about 70 degrees. Decelerating flight produces further increases in the nose-up moment. Ground proximity reduces the nose-up pitching moments. The large nose-up moments can be trimmed by use of duct-exit control vanes. The results show that unloading the duct (shroud) by flying at a wing angle of attack of 15 degrees reduces the power required by about 30 percent at 50 knots. Duct-lip stall produces large increases in power required. Results show that full-scale aerodynamic simulation can be made with small-scale wind-tunnel models if duct-lip separation at low Reynolds numbers is avoided. (Author)

AD-268 842 Div. 1, 9
(TISTA/VGW) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
AERODYNAMIC LOADS ON AN ISOLATED SHROUDED-PROPELLER CONFIGURATION FOR ANGLES OF ATTACK FROM -10 DEGREES TO 110 DEGREES,
by Kalman J. Grunwald and Kenneth W. Goodson. Jan 62, 29p. incl. illus. table, 5 refs. (NASA Technical note D-995)
Unclassified report

Also available from NASA, Wash. 25, D C., as NASA Technical note D-995.

DESCRIPTORS: (Aerodynamics, Load distribution between Shroud rings, Aerial propellers, *Shrouded propellers for Vertical take-off planes, Model tests, Wind tunnel models, Aerodynamic configurations, Tests, Thrust, Pitch, Moments, Drag, Pressure.)

An investigation of the division of loads between the propeller and the shroud of a shrouded-propeller configuration was conducted in the 17-foot test section of the Langley 300-MPH 7- by 10-foot tunnel. This investigation covered an angle-of-attack range from -10 to 110 degrees and a range of advance ratios (0 to 0.595) typical of the transition speed range of a tilt-duct VTOL aircraft. For the configurations with fixed blade angle (24 degrees at the three-quarter radius), the normal force and pitching moment developed by the propeller and spinner were only a relatively small part of the over-all normal force and pitching moment of either a stalled or an unstalled shroud. The ratio of the thrust of the propeller and spinner to total thrust was found to vary from about 0.4 in hovering to about 0.7 at the highest advance ratio of the tests, 0.595, with the shroud at zero angle of attack. (Author)

AD-268 899 Div. 1, 4
(TISTA/LSK) OTS price $10.50

Aircraft Armaments, Inc., Cockeysville, Md.
DESIGN AND DEVELOPMENT OF THE MK 12 MOD 0 AIRCRAFT CHEMICAL TANK.
Final engineering rept., 19 Nov 59-30 Sep 61, by Edward W. Davis. 30 Sep 61, 1v. incl. illus. tables, 11 refs.
(Contract DA 18-108-405-cml-614)
Unclassified report

DESCRIPTORS: (*Aircraft chemical tanks, *Spray tanks, *Smoke generators for Jet planes, Design, Manufacturing methods, Tests.)

The report covers the design, fabrication and testing of the E33 Smoke Tank (MK 12 Mod 0) for use on the A4D and FJ4B A/C. Design is in accordance with and meets requirements of MIL A 8591 and MIL E 5272 for altitudes to 45000 ft and speeds to Mach 1. One tank can produce a curtain 1200 ft long from altitudes as high as 300 ft. (Author)

AD-268 916 Div. 1, 30
(TISTA/LSK) OTS price $7.60

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
ANALOG SIMULATION AND ANALYSIS OF A NON-LINEAR SELF-ADAPTIVE FLIGHT CONTROL SYSTEM.
Master's thesis,
by Thomas J. Deegan. Aug 61, 68p. incl. illus. tables, 9 refs. (Rept. no. GA/EE/61-1)
Unclassified report

DESCRIPTORS: (Analog computers, Simulation, *Automatic pilots, Automatic, *Control systems, Servo systems, Signals, Feedback oscillators, Airplanes, Rocket planes.) (Dynamics, Stability, Stability (Lateral), Stability (Longitudinal), Moments, Motion, Computers, Simulation, Mathematical analysis.) *Theses.

An analog simulation was conducted for the longitudinal axis of the General Electric Self-Adaptive Flight Control (GESAC) System, as proposed for use on the X-15 aerospace vehicle. The gain-changing dynamics of the non-linear loop are considered briefly and the effects of noise on system operation are observed. A method of optimizing the system simulation by first considering the non-linear loop independently is described. It is shown that this system is capable of maintaining aircraft stability throughout the X-15 re-entry flight profile and that noise introduced during system operation does not seriously degrade system performance. (Author)

2. ASTRONOMY, GEOPHYSICS AND GEOGRAPHY

AD-268 126 Div. 2, 24
(TISTA/VGW) OTS price $1.10

Manchester U. (Gt. Brit.).
RESEARCH ON LUNAR PHOTOMETRIC AND TOPOGRAPHIC ANALYSIS.
Final technical rept.,
by Zdenek Kopal. Oct 60, 8p.
(Contracts AF 61(052)168 and AF 61(052)380)
(AFCRL-650) Unclassified report

DESCRIPTORS: (*Moon, Mapping, Photographic analysis of Surface targets on Motion picture photography from Astronomical cameras, Motion picture cameras, Topographic cameras, Test facilities, Tests.) (Moon, Terrain, Mountains, Configuration, Determination, Measurement.)

Development is reported of methods for lunar cine-photography, which should record the growth and diminution of shadows cast by the lunar mountains and other formations on the surrounding landscape during sunrise or sunset on the Moon, the measurements of which (by suitable micro-photometric methods) could lead to a determination of heights of the shadow-casting obstacles, essentially by triangulation. Test results show that the shadow technique permits determination of relative altitudes of lunar mountains within the errors of less than 10 metres at the centre of the apparent lunar disk, growing proportionally towards the limb. Selenographic positions can be measured on our negatives with a precision of the order of 1 ft in either selenographic coordinate; and the errors inherent in such positions constitute, in fact, also the principal source of errors affecting the computed heights. It is expected that both these sources of error will be appreciably reduced in further development of our work. There appear to be no steep slopes on the Moon, of sizes larger than a few kms, which would be inclined to the horizontal direction by more than 10 degrees. (Author)

AD-268 135 Div. 2, 30, 12
(TISTA/WAW) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
PHYSICAL SIGNIFICANCE OF THE TIROS II RADIATION EXPERIMENT,
by R. A. Hanel and D. Q. Wark. Dec 61, 16p. incl. illus. (NASA Technical note D-701)
(In cooperation with the U. S. Weather Bureau)
Unclassified report

Paper presented at the Optical Society of Americs in Pittsburgh, Pennsylvania, Mar. 1961.

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-701.

DESCRIPTORS: (Satellite vehicles, *Meteorology, Weather forecasting, Scientific research, *Earth, Atmosphere, *Solar energy, Light, Reflection, *Infrared radiation, Measurement.) (Instrumentation, *Radiometers, Design.)

The meteorological satellite TIROS II carries a five-channel radiometer which scans the earth as the satellite rotates. Two channels are sensitive to sunlight reflected from the earth; three are responsive to terrestrial infrared emission. The effect of the optical properties upon the measurements is discussed. Calculations based on model atmospheres show the sources of outgoing terrestrial radiation and limb-darkening effects for two of the channels. A map of the radiation received by the channel sensitive in the window region (8 to 12 microns) is compared with a conventional weather chart. (Author)

AD-268 163 Div. 2, 25
(TISTP/JW) OTS price $1.60

Oslo U. (Norway).
RESEARCHES IN THE FIELD OF SOLAR RADIO NOISE, SUNSPOTS, PROMINENCES AND FLARES.
Summary rept. 1 Jan 59-31 Dec 60.
21 Jan 61, 19p. 12 refs.
(Contract AF 61(052)186)
(AFCRL-806) Unclassified report

DESCRIPTORS: (*Sunspots, Correlation techniques, Interferometers.) (*Solar noise, Radio transmission, Solar disturbances, Astronomical observatories, Spectrographic analysis.) (Solar observatories, Astronomical data, *Photographic equipment.)

Contents:
Solar radio noise
Investigations of sunspots
Researches on prominences, plages and solar temperature
Instrumental designs

AD-268 171 Div. 2
(TISTP/MFA) OTS price $3.60

Narragansett Marine Lab., U. of Rhode Island, Kingston.
SEISMIC REFRACTION INVESTIGATIONS IN SELECTED AREAS OF NARRAGANSETT BAY, RHODE ISLAND.
Technical rept. no. 7 on Acoustics Project, by William B. Birch and Frank T. Dietz. Nov 61, 32p. incl. illus. table, 15 refs. (Reference no. 61-5)
(Contract Nonr-39604, Proj. NR 385-205)
Unclassified report

DESCRIPTORS: (*Seismic waves, *Refraction and Detonation waves, Sound transmission, Explosions in Sedimentation, Granite, *Narragansett Bay, Ships.) (Instrumentation, Hydrophones, Amplifiers, Lowpass filters, Oscillographs, Cameras.) (Experimental data, Tables.)

Seven reversed refraction profiles were fired in 4 shallow water areas in Narragansett Bay, R. I. Results are presented in the form of reversed travel time graphs and cross sectional representations of the strata. Seismic velocities and layer depths are shown in tabular form. The thickness of the sediment layer varies from about 14 to 52 m, with the thicker portions generally occurring in the northernmost area. The depth of the upper refracting horizon, the boundary between the sediment layer and the intermediate layer, varies from 23 to 45 m below mean low water. The intermediate layer varies in thickness from about 290 m at the northern end of the bay to 58 m toward the south. The lower refracting horizon, the boundary between the intermediate layer and the third layer, ranges in depth from 85 to 340 m below the datum level. (Author)

AD-268 194 Div. 2
(TISTP/WH) OTS price $1.10

Weizmann Inst. (Israel).
TERRESTRIAL SPECTROSCOPY,
by C. L. Pekeris, Z. Alterman and H. Jarosch. 5 Apr 61, 6p. illus. 9 refs. (Technical note no. 1)
(Contract AF 61(052)509)
(AFCRL-832) Unclassified report

DESCRIPTORS: (*Earth, Rotation, Spectrographic analysis, *Magnetic fields, *Terrestrial magnetism.) (Seismic waves, Seismographs, Frequency, Wave characteristics.) (Earth, Gravity, Elasticity.) (Earthquakes, Peru.) (Geology, Geophysics.)

It is shown that the rotation of the earth splits each line of its spectrum of order n into a multiplet of (2n+1) lines. The theory is developed for multiplet intensities in the case of a point-source. The results are in good agreement with the multiplets observed gravimetrically and seismically. (Author)

AD-268 195 Div. 2
(TISTP/MFA) OTS price $3.60

Weizmann Inst., (Israel).
ROTATIONAL MULTIPLETS IN THE SPECTRUM OF THE EARTH,
by C. L. Pekeris, Z. Alterman, and H. Jarosch.
5 July 61, 29p. incl. illus. tables, 21 refs.
(Technical note no. 2)
(Contract AF 61(052)509)
(AFCRL-843) Unclassified report

DESCRIPTORS: (*Earth, *Oscillation, *Terrestrial magnetism, Earth models, Seismic waves, Earthquakes, Geophysics, Rotation, Velocity.) (Perturbation theory, Gravity, Measurement.) (Harmonic analysis, Harmonic oscillators, Partial differential equations, Fourier analysis.) (Experimental data, Tables.)

A theory is developed for the effect of the earth's rotation on its spectrum. Each line is resolved by rotation into a multiplet of (2n+1) lines, as in the Zeeman effect. A theory is also given of the intensity distribution in the lines of the multiplet for the case of a point-source. Good agreement is obtained between this theory and the doublets observed seismically and gravimetrically. (Author)

AD-268 196 Div. 2, 15
(TISTP/MFA) OTS Price $5.60

Uppsala U. (Sweden).
FORBUSH DECREASES SEP 1, 1956-DEC 31, 1959. HOURLY AND QUARTER-HOURLY DIAGRAMS,
by Arne Eld Sandstrom. 30 Mar 61, 25p. illus. 2 refs. (Technical note no. 5)
(Contract AF 61(514)1312)
(AFCRL-661) Unclassified report

DESCRIPTORS: (*Terrestrial magnetism, Magnetic storms, *Ionospheric disturbances, Cosmic rays, Particles, Mesons, Nucleons, Periodic variations.) (Statistical data, *Tables, Probability.) (Instrumentation, Counting methods, Neutron counters, Cosmic ray telescopes.)

A collection of tables and diagrams concerning Forbush decreases during the period Sept. 1, 1956 to Dec. 31, 1959 is presented. Bihourly diagrams of all Cosmic Ray storms recorded during this period were reproduced in Technical Note No. 4. In the present note hourly and quarter-hourly values are presented for some of the most remarkable of these decreases. Details of Cosmic Ray storms are given as registered by 8 separate instruments in Uppsala and Murchison Bay which can be regarded as simultaneous or not. The ratios between the variations of the meson and nucleon components were calculated for the Uppsala and Murchison Bay stations. Some conclusions are being drawn. The lapse of time between s.s.c:s and correlated Forbush decreases was studied. (Author)

AD-268 197 Div. 2, 15
(TISTP/MFA) OTS price $2.60

Uppsala U. (Sweden).
STATISTICAL STUDIES OF THE PERFORMANCE OF COSMIC RAY RECORDING INSTRUMENTS,
by Eric Dyring. 5 Apr 61, 13p. illus. tables, 12 refs. (Technical note no. 6)
(Contract AF 61(514)1312)
(AFCRL-673) Unclassified report

DESCRIPTORS: (*Cosmic rays, *Instrumentation, Neutron counters, Cosmic ray telescopes, Particles, Counting methods.) (*Statistical analysis, Statistical distributions, Errors, Probability.) (Experimental data, Tables.)

A method to determine the variance of statistical fluctuations for instruments used in the registration of the cosmic radiation - the neutron monitor, the duplex cubical counter telescope and the directional telescopes - is presented. The standard errors of data from cosmic ray instruments are estimated. The results are compared with the standard errors calculated from the theoretical Poisson distribution. It is stressed that the Poisson distribution will give an underestimation of the standard errors. (Author)

AD-268 199 Div. 2, 20, 25
(TISTP/WH) OTS price $4.60

Uppsala U. (Sweden).
COSMIC RAY INTENSITY VARIATIONS DURING 1960,
by A. E. Sandstrom, E. Dyring and others.
26 Apr 61, 24p. illus. 4 refs. (Technical scientific note no. 8)
(Contract AF 61(514)1312)
(AFCRL-854) Unclassified report

DESCRIPTORS: (*Cosmic rays, Intensity, *Diurnal variation, Sweden, Monitors.) (Cosmic rays, Nucleons, Mesons.) (Cosmic rays, Solar disturbances, Terrestrial magnetism, Diurnal variations, Statistical analysis.)

This analysis contains tables and clock diagrams of the first and second harmonics of the daily variation during the calendar year 1960. Two more 12-monthly periods are included, one ending on 30 Apr 1960 and the other on 31 Aug 1960. The cosmic ray storms (Forbush decreases) during 1960 are displayed in diagrams over the intensity variations in per cent of a normal counting rate. Detailed diagrams of the solar flare effect on 4 May 1960 are presented. (Author)

AD-268 200 Div. 2, 20, 25
(TISTP/WH) OTS price $1.60

Uppsala U. (Sweden).
COSMIC RAY FLUCTUATIONS IN THE NUCLEONIC AND MESON COMPONENTS IN UPPSALA DURING NOV. 10-22, 1960,
by Eric Dyring. 25 May 61, 6p. illus. 9 refs.
(Technical note no. 9)
(Contract AF 61(514)1312)
(AFCRL-857) Unclassified report

DESCRIPTORS: (*Cosmic rays, *Diurnal variation, Sweden, Monitor.) (Cosmic rays, Nucleons, Mesons.) (Cosmic rays, Solar disturbances, Terrestrial magnetism, Diurnal variation, Statistical analysis.)

The large cosmic ray fluctuations during the period Nov. 10 to 22, 1960 in the nucleonic and meson component seen by the Uppsala Cosmic Ray Station are presented in 5- or 15-min. values as well as 1-hour values. Correlation is made with sun and geomagnetic data. Some comparisons are made with other stations. (Author)

AD-268 348 Div. 2
(TISTP/MFA) OTS price $2.60

Rochester U., N. Y.
THE He-3/(He-3+He-4) RATIO IN PRIMARY COSMIC RADIATION,
by M. V. K. Appa Rao. 17 Nov 61, 13p. illus.
(Sponsored by Air Force Office of Scientific Research and Development Command)
Unclassified report

DESCRIPTORS: (*Cosmic rays, Particles, Scattering, *Helium, Isotopes, Nucleons, Nuclei, Interstellar matter, Spallation.) (Astronomical data, Tables, Statistical analysis, Probability.)

The ratio R equals He3/ (He3 + He4) is determined using a nuclear emulsion stack exposed at the geomagnetic latitude 61 N on August 3, 1958 under 3.8 gms/sq. cm. of matter. The ratio R found at the top of the atmosphere is 0.31 + or - 0.08 for the same energy per nucleon (160-355 Mev) and 0.33 + or - 0.08 for the same rigidity (1.05 - 1.48 Bv). These values are lower than a previous observation, but in agreement within the statistical errors, thus implying little or no time variation in the ratio R over a period of one year. (Author)

AD-268 361 Div. 2, 15
(TISTP/GRW) OTS price $7.60

Air Force Missile Test Center, Patrick Air Force Base, Fla.
A PROPOSAL FOR DEVELOPING A HURRICANE PLAN WITH A BUILT-IN DECISION-MAKING CAPABILITY,
by Max J. Cleveland. Nov 61, 75p. incl. illus. tables (Rept. no. OA WP 61-3)
Unclassified report

DESCRIPTORS: (*Hurricanes, Tropical regions, Storms, Caribbean Sea, *Statistical analysis, Probability.) Weather forecasting.

This study originated to determine a statistical measure of the ability of weather forecasters to prognosticate the movement of tropical storms and hurricanes in the Caribbean Sea area. The knowledge gained was exploited into the formulation of a scheme which provided a probability basis for deciding if and when storm preparations should be made. This scheme made it feasible to construct a hurricane plan with hedging characteristics. The objectives are to present: (1) the results of the statistical study, (2) the probability scheme developed for preparedness decision-making, and (3) the outline for developing a hurricane plan with hedging characteristics which incorporates the decision-making mechanism. (Author)

AD-268 400 Div. 2, 22
(TISTW/RD) OTS price $10.50

Lockheed Aircraft Corp., Sunnyvale, Calif.
ANALYSIS OF JASON DATA.
Final rept.
Oct 61, 132p. incl. illus. tables, 2 refs.
(Rept. no. 2-96-61-1)
(Contract AF 29(601)2862, Proj. 7811)
(AFSWC TR 61-82) Unclassified report

DESCRIPTORS: (Detection of Electrons in Magnetic fields of Earth by *Sounding rockets.) (Injection of Electrons into Magnetic fields of Earth by Nuclear explosions.) (Detection of Electrons with Geiger counters.) (Geiger counters, Calibration.) (Test equipment, Beta ray spectrometers.) (Meteorological data, Analysis.)

Investigations are described of the data obtained by the Jason sounding rockets during the Argus tests. These instrumented rockets detected electrons which were injected into the geomagnetic field by the detonation of nuclear devices at high altitudes. The investigations yielded: (1) the orientations of the detectors with respect to a plane perpendicular to local magnetic lines of force, (2) the calibration of the detectors in a planar flux of electrons as functions of electron energy and orientation of the detectors with respect to the electron plane, and (3) a re-evaluation of the Jason data based on items (1) and (2) and on recent data on characteristics of the natural radiation. (Author)

AD-268 403 Div. 2
(TISTP/JW) OTS price $4.60

Army Signal Research and Development Lab., Fort Monmouth, N. J.
WIND-MEASURING SET AN/TMQ-13(XE-2),
by Donald E. Johnson and Eugene E. Sartor.
Sep 61, 39p. incl. illus. tables, 4 refs. (ASRDL technical rept. no. 2225)
Unclassified report

DESCRIPTORS: (*Anemometers, *Wind, Measuring, Errors, Analysis.) (*Theodolites, Balloons, Design.)

The general development of Wind-Measuring Set AN/TMQ-13(XE-2) is discussed, and a detailed review is made of the design-modifications that have been incorporated in the service-test model. A brief summary is made of the theory of design and of the system errors. (Author)

AD-268 454 Div. 2, 12
(TISTA/VGW) OTS price $1.60

National Aeronautics and Space Administration, Washington, D. C.
VELOCITY MODIFICATION FOR EARTH CAPTURE OF AN ASTRONOMICAL BODY IN THE SOLAR SYSTEM,
by Su-Shu Huang. Dec 61, 11p. incl. illus. tables, 4 refs. (NASA Technical note no. D-1140)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1140.

DESCRIPTORS: (*Celestial mechanics, Solar systems, Planets, Velocity for Orbital flight paths around Earth, Mathematical prediction.) (Sun, *Satellite vehicles, Interception, Interception probabilities.)

In studying the possible capture of an astronomical body that is orbiting around the sun, two questions are encountered: How near must it approach the earth before it could be captured. How could we make it approach as near to the earth as required. This paper answers the first question by using the results of the restricted three-body problem, and partially answers the second question by estimating the order of magnitude of the velocity modification needed to change the orbit of the body and make capture possible. (Author)

AD-268 455 Div. 2
(TISTP/WH) OTS price $1.10

National Aeronautics and Space Administration, Washington, D. C.
DIRECT MEASUREMENTS OF INTERPLANETARY DUST PARTICLES IN THE VICINITY OF EARTH,
by C. W. McCracken, W. M. Alexander, and M. Dubin. Dec 61, 5p. incl. illus. 3 refs. (NASA Technical note no. D-1174)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1174.

DESCRIPTORS: (*Interstellar matter, Distribution, Earth, Atmosphere.) (Experimental data, Collecting methods, Satellite vehicles.)

The direct measurements made by the Explorer VIII satellite provide the first sound basis for analyzing all available direct measurements of the distribution of interplanetary dust particles. The model average distribution curve established by such an analysis departs significantly from that predicted by the (uncertain) extrapolation of results from meteor observations. A consequence of this difference is that the daily accretion of interplanetary particulate matter by the earth is now considered to be mainly dust particles of the direct measurements range of particle size. Almost all the available direct measurements obtained with microphone systems on rockets, satellites, and spacecraft fit directly on the distribution curve defined by Explorer VIII data. The lack of reliable datum points departing significantly from the model average distribution curve means that available direct measurements show no discernible evidence of an appreciable geocentric concentration of interplanetary dust particles. (Author)

AD-268 496 Div. 2
(TISTM/GEC) OTS price $5.60

Geophysics Corp. of America, Bedford, Mass.
HELIUM IN THE EARTH'S ATMOSPHERE,
by G. Sauermann and R. Herzog. Aug 61, 53p. incl. illus. tables, 40 refs. (GCA Technical rept. no. 61-6-N)
(Contract NAS5-270)
Unclassified report

DESCRIPTORS: (*Helium, Ionosphere, *Upper atmosphere, Density, Theory, Mass spectroscopy, Radioactive decay.)

An investigation of the He distribution in the atmosphere and its escape process was made. The escape flux was calculated. An He mass spectrometer was designed and built which measures relative concentration. The theoretical investigations described demonstrated the need of He concentration figures to accurately describe the earth's atmosphere and gain information about the mictopause level.

AD-268 556 Div. 2
(TISTA/VGW) OTS price $1.60

Air Force Cambridge Research Labs., Bedford, Mass.
MICROMETEORITE MEASUREMENTS FOR THE MIDAS II SATELLITE (1960 ZETA 1),
by R. K. Soberman and L. Della Lucca. Nov 61, 7p. incl. illus. 5 refs. (Rept. no. AFCRL-1053; GRD Research notes no. 72)
Unclassified report

DESCRIPTORS: (Satellite vehicles, Measurement of *Meteorites, Particles, Frequency, Density, Collecting methods, Detection, Detectors, Acoustic detectors, Wire screens.) (Astronomical data, Analysis.)

Five micrometeorite sensing devices were carried on board the Midas II (1960 Zeta 1) satellite which was launched into an approximately 500-km circular equatorial orbit on 24 May 1960. The five devices consisted of three acoustic detectors and two wire-grid detectors. Data were obtained for four partial orbits. These data were recorded in real time. There were no breaks in the wire grids which could record impacts of particles larger than 10 microns. Sixty-seven impacts were recorded on the acoustic detectors which had a momentum threshold of 3 x 10 to the -4th power gm cm/sec and a total area of 0.0686 sq m. These results indicate a flux of 0.25 sq m sec of particles 5 microns in diameter or larger if one assumes a mean velocity of 15 km/sec and a density of 3 gm/cc for the particles. The discrepancy between acoustic and wire-grid data is discussed. (Author)

AD-268 600 Div. 2, 30
(TISTP/WH) OTS price $5.60

Naval Weapons Lab., Dahlgren, Va.
COMPUTER PROGRAMS FOR ASTRONAUTICS: THE ASTRO PROGRAM, SEGMENTS 10 AND 20,
by C. Frederick Peters. 24 Jan 62, 49p. incl. illus. (NWL rept. no. 1784)
Unclassified report

DESCRIPTORS: (*Orbital flight paths, *Celestial mechanics, Mathematical analysis, *Computers, Programming.)

A computer program used by the Naval Weapons Laboratory to improve initial estimates of orbit parameters by the method of special perturbations is described. (Author)

AD-268 685 Div. 2, 12, 6
(TISTP/FR) OTS price $8.10

Ionosphere Research Lab., Pennsylvania State U., University Park.
FEASIBILITY STUDY OF A SEPARATING CAPSULE ROCKET EXPERIMENT FOR THE ACCURATE DETERMINATION OF ABSOLUTE ELECTRON DENSITIES TO A HEIGHT OF ABSOLUTE ELECTRON DENSITIES TO A HEIGHT OF SEVERAL THOUSAND KILOMETERS,
by J. S. Nisbet, T. P. Quinn, and B. H. Carson. 1 Nov 61, 75p. incl. illus. 17 refs. (Scientific rept. no. 152)
(NASA Grant no. NsG-134-61)
Unclassified report

DESCRIPTORS: (*Ionosphere, Electrons, Density, *Measurement, *Feasibility studies.) (Sounding rockets, Staging, Separation, Telemetering receivers, Telemetering transmitters, Telemetering antennas.)

An investigation of a new type experiment for the measurement of electron densities in the upper F region of the ionosphere using rockets is described. Also described are the theory of the experiment and the predicted accuracy under various ionospheric conditions. The specifications for the necessary equipment to conduct an initial experiment are given with the design considerations on which these were based. Recommendations are made for two series of experiments: an initial series extending to 1100 Km using the Argo D4 research rocket, followed by a further series to 2500 Km using the Argo D8. (Author)

AD-268 690 Div. 2, 24
(TISTP/FR) OTS price $1.60

Howell, W. E., Associates, Inc., Lexington, Mass.
THE STEREONEPHOGRAPH: A DEVICE TO MAP CLOUDSCAPES FROM AERIAL PHOTOGRAPHS,
by Wallace E. Howell. 30 Oct 61, 11p. incl. illus. table (Scientific rept. no. 1)
(Contract AF 19(604)7281)
(AFCRL TR 61-895) Unclassified report

DESCRIPTORS: (*Clouds, *Mapping, Aerial photography, High altitude, Aircraft.) (*Stereoscopic map plotters, Stereoscopic projectors, Aerial photographs.)

An instrument has been constructed that forms a stereoscopic image of clouds photographed from very-high-flying aircraft in such a way that maps of the cloudscape can be drawn, either in detail over small areas or over extensive flight paths, with contours or other three-dimensional representations. Various methods of orienting pairs of photographs so as to obtain an undistorted image were tried. In the course of these trials it was noted that nearly all cloudscapes seen from great altitudes contain strong clues as to what constitutes a horizontal surface, and a method was developed of orienting the pictures by comparing these clues with horizontal reference lines. An example of a cloud map prepared with the instrument is shown. (Author)

AD-268 737 Div. 2
(TISTA/LSK) OTS price $2.25

National Aeronautics and Space Administration, Washington, D. C.
SPACE DEBRIS HAZARD EVALUATION,
by Elmer H. Davison and Paul C. Winslow, Jr. Dec 61, 95p. incl. illus. 78 refs. (NASA Technical note no. D-1105)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note no. D-1105.

DESCRIPTORS: (*Space flight, Hazards, *Interstellar matter, Comets, Meteors, Meteorites, Planets.)

The hazard to space vehicles from natural space debris was explored. A survey of the available information pertinent to this problem is presented. The conclusion reached is that a definite hazard exists but that it can only be poorly assessed on the basis of present information. The need for direct measurement of this hazard is obvious, and some of the problems involved in making these direct measurements have been explored. (Author)

AD-268 741 Div. 2
(TISTP/FR) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
INTERPLANETARY DUST PARTICLES OF MICRON SIZE PROBABLY ASSOCIATED WITH THE LEONID METEOR STREAM,
by W. M. Alexander, C. W. McCracken and H. E. LaGow. Dec 61, 6p. incl. illus. tables, 6 refs. (NASA Technical note D-1154)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1154.

DESCRIPTORS: (*Interstellar matter, *Particles, Impact shock on Satellite vehicles.) Monitors.

An interplanetary dust particle event, coincident with the Leonid meteor shower and lasting approximately 70 hours, was recorded by a sensor on the Vanguard III satellite. During this interval the satellite's microphone system registered impacts of approximately 2800 dust particles with momenta exceeding 1/100 dyne-second. The impact rate varied by as much as two orders of magnitude within a few hours. The microphone system was almost omnidirectional, so the radiants of the dust particles cannot be defined. Association of these dust particles with the Leonid meteor stream is suggested by the coincidence in time and by the location of the satellite. Vanguard III traversed five major meteor streams, but the impact rates significantly exceeded the background rate only during this one interval. This is the first case in which a significant increase in the directly measured impact rate of dust particles possibly can be associated with a major meteor stream. (Author)

AD-268 749 Div. 2, 12
(TISTA/LSK) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
A COMPARISON OF THEORY AND OBSERVATION OF THE ECHO I SATELLITE,
by R. W. Bryant. Dec 61, 7p. incl. illus. 12 refs. (NASA Techninal note D-1124)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1124.

DESCRIPTORS: (Satellite vehicles, *Satellite vehicle trajectories, *Orbital flight paths, Celestial mechanics, Perturbation theory, Gravity, Drag, Space environmental conditions.)

Observations of the Echo I balloon satellite were compared with a theory including the following perturbing effects: (1) solar radiation pressure; (2) lunar and solar gravitation; (3) second, third, and fourth harmonics of the earth's gravitational potential; and (4) atmospheric drag. With a set of orbital elements at the 26th day of the lifetime of the satellite, it was possible to match the observational data to 180 days with root mean square residuals. No differential correction was applied. Values of atmospheric density between 1500 and 930 km, assuming neutral drag effects only, have been inferred from the orbital data. The connection between solar activity and drag is also examined. As the Echo I perigee height continues to oscillate between 900 and 1500 km, more valuable orbital data will be obtained and atmospheric properties will be deduced. Further refinements in the mathematical model, especially in a time-dependent model atmosphere, should bring a substantial reduction in the residuals of the observations. (Author)

AD-268 929 Div. 2
(TISTP/FR) OTS price $11.50

Oregon U., Eugene.
SOME RECENT PHYSICAL CHANGES OF THE OREGON COAST.

Final rept.,
by Samuel N. Dicken, Carl L. Johannessen and Bill Hanneson. 15 Nov 61, 151p. incl. illus., refs.
(Contract Nonr-277104, Proj. NR 388-062)
Unclassified report

DESCRIPTORS: (*Beaches, Estuaries, Oregon, Erosion, Sedimentation.) (*Ocean waves, Ocean currents, Tides, Floods, Storms, Wind, Avalanches.) (Swamps, Sand, Plants, Breakwaters.) *Geology.

Some of the physical changes of the Oregon coast (from the California boundary to the Columbia River) which have occurred since settlement are discussed. Included are changes of the beaches and the immediate backshore, of the active dunes near the shore, and of the estuaries. Some discussion is of a more general nature, to place the specific studies in the proper perspective. The time span, arbitrarily chosen, is the period since white settlement, a little more than a century. This is the time for which historical records are available to document the nature of the changes. The purpose is to describe, measure, and explain some of the Oregon coast changes within the limitations of time and resources available. Special emphasis is placed on the beaches, dunes, and tidal marshes in the estuaries, where changes have occurred and are occurring. Many aspects of these three categories and many lines of investigation had to be left unstudied. (Author)

AD-268 943 Div. 2
(TISTP/FR) OTS price $2.60

Stanford Research Inst., Menlo Park, Calif.
DIRECT OBSERVATIONS OF DEEP WATER MOVEMENT IN THE PACIFIC OCEAN. AN EASTERN BOUNDARY UNDERCURRENT STUDY.
Summary rept.,
by G. M. Cresswell, G. L. Pressman, and P. M. Newgard. 21 Dec 61, 23p. incl. illus. table, 2 refs.
(Contract Nonr-353600, Proj. NR 083 149)
Unclassified report

DESCRIPTORS: (*Ocean currents, Underwater, Pacific Ocean, Velocity, Measurement.) (Floats, Underwater, Sound ranging, Underwater sound, Depth indicators.)

Studies of deep water movements, using neutral buoyancy floats, were carried out in the eastern Pacific in tropical and low northern temperate latitudes. Prior to the present study no float observations had been made in the area of the eastern boundary current off the California coast. An ultimate objective of the reported observations is to aid in understanding the thermohaline circulation of the world ocean; an immediate objective is to begin the determination of characteristics of water movement beneath the southward-drifting, presumably shallow, California current. (Author)

AD-268 948 Div. 2
(TISTP/FR) OTS price $4.60

United Research, Inc., Cambridge, Mass.
MEASUREMENT OF WIND SHEAR.
Final rept. 1 Dec 59-30 June 61 on Component Construction and Testing,
by Thomas E. Beling, Donald R. Benders and Roland L. Plante. 30 June 61, 40p. incl. illus. tables.
(Contract DA 36-039-sc-84950; Continuation of Contract DA 36-039-sc-75064)
Unclassified report

DESCRIPTORS: (*Wind, Velocity, *Shear stresses, Measurement.) (Accelerometers, Magnetometers, Pressure switches, Barometric pressure, Radiosondes, Parachutes.) (Data processing systems, Telemetering data.)

A wind shear measuring system is described. The wind shear probe, the critical component of the system, consists of an 18-pound, 77 inch-long cylinder, 6 inches in diameter, with two concentric cylindrical wing surfaces, 24 and 18 inches in diameter, respectively. This probe is aerodynamically tuned to fall vertically regardless of wind forces. This tuning allows the measurement of horizontal wind forces to be reduced to a measurement of horizontal accelerations experienced by the probe during its fall. A knowledge of probe azimuthal orientation and altitude is required to determine the direction and magnitude of wind forces as a function of altitude - i.e., wind shear. The probe is instrumented to measure horizontal accelerations in two quadrature axes, azimuthal orientation, and altitude, and to transmit this information continuously during a drop. Telemetered data in the form of a hybrid PDM/PPM code is received by the ground station. These data are modified by the ground logic system to a form suitable for reduction by an IBM 704 computer. (Author)

AD-268 968 Div. 2
(TISTP/FR) OTS price $2.60

Army Signal Missile Support Agency, White Sands Missile Range, N. Mex.
VARIABILITY OF SURFACES WIND IN SHORT DISTANCES.
Progress rept. no. 1,
by Roy L. Lamberth and Daniel R. Veith. Oct 61, 18p. incl. illus. table.
Unclassified report

DESCRIPTORS: (*Wind, Velocity, Direction finding, Statistical analysis, Vector analysis.) (Guided missile trajectories, Climatic factors.)

The variability of almost 2,500 pairs of five-second intervals of wind direction and wind speed was studied. Data for the study were obtained from sensors located 12 feet above ground and 50 feet apart in a flat area. By vector correlation techniques an equation was derived for predicting the wind components at one sensor as a function of the other. These predictions are accurate to + or - 4.6 MPH for 95 percent of the cases. A second approach used 32 pairs of 30-minute intervals of wind data collected with the same sensors at the same site. These 30-minute intervals were separated into five-second series. The time variability of these pairs has been treated with spectral analysis. Although the spectra differed widely, they were similar to usual daytime wind spectra. The cross spectra will be computed later. (Author)

3. CHEMICAL WARFARE EQUIPMENT AND MATERIALS

AD-268 399 Div. 3, 16
(TISTB/CCH) OTS price $2.60

Institute for Cooperative Research, U. of Pennsylvania, Philadelphia.
TACHPHYLAXIS AND TOLERANCE TO ANTICHOLINESTERASE DRUGS IN MAN. PART I. RAT WHOLE BLOOD CHOLINESTERASE METHOD. PART II. STUDIES OF THE MECHANISMS OF TACHPHYLAXIS IN ANIMALS. PART III. THE EFFECT OF STEROIDS ON THE ACTION OF ANTICHOLINESTERASE AGENTS. PART V. APPENDIX. LIST OF PUBLICATIONS 1951-1961.
Annual comprehensive rept., 1 Jan-31 Dec 61, by Michael P. McQuillen, Richard J. Johns and others. Dec 61, 21p. incl. illus. tables, 45 refs.
(Contract DA 18-108-405-cml-120)
Unclassified report

DESCRIPTORS: (*Chemical warfare agents, *Toxicity, Inhibition by *Immunization in Man, Laboratory animals, Therapy.) (Blood, *Cholinesterase, Determination, Chemical reactions with Acetylcholines.) Adrenal cortical extract, Steroids, Neuromuscular transmission, Drugs.

AD-268 430 Div. 3, 13, 18
(TISTB/LH) OTS price $1.10

Hughes Aircraft Co., Culver City, Calif.
FEASIBILITY AND DESIGN STUDY FOR COLLECTIVE PROTECTION EQUIPMENT FOR THE AN/MSG-4 SYSTEM.
Monthly progress rept., 1 Nov-1 Dec 61, by K. M. Spradlin. 1 Dec 61, 9p. incl. illus.
(GSG rept. no. 1610.30/170; SD 61-212)
(Contract DA 18-108-cml-6618)
Unclassified report

DESCRIPTORS: (*Antiaircraft defense systems, *Shelters, Portable shelters, Air conditioning equipment, *Particulate filters, Safety devices, Pneumatic devices, *Radar trailers, Trailers, Vehicles, Installation, Design.) (Biological warfare, Chemical warfare, Radiological warfare, Aerosols.)

The purpose of this study is to evaluate the feasibility of installing collective protection (air filtration) equipment on semitrailer vans, trucks, and air-transportable shelters that contain the various subsystems of the AN/MSG-4 Antiaircraft Defense System. The collective protection equipment will include: a chemical, bacteriological, and radiological (CBR) filter for filtering irritating, noxious, and toxic gases and aerosols from the air; a pressure-control device to maintain minimum pressure of the air conditioning system; and an air lock that permits personnel to make safe entry and exit from the various vehicles and shelters. Mockups of proposed CBR filters and a mockup of a protective entrance will be fabricated following completion of the initial phase of the feasibility study. (Author)

AD-268 562 Div. 3, 7
(TISTW/JRG) OTS price $3.60

Aircraft Armaments, Inc., Cockeysville, Md.
E41 GAS ALARM.
Status rept. 14 Oct-25 Nov 61.
Nov 61, 35p. incl. illus. (Rept. no. ER-2575)
(Contract DA 18-108-cml-6553)
Unclassified report

DESCRIPTORS: (*Gas detectors, *Toxic agent alarms, Effectiveness, Reliability, Tests.) (Photoelectric cells, Photometers, Electric bridges, Heaters, Acoustic horns, Tests.)

AD-268 982 Div. 3, 29, 16, 23
(TISTB/CCH) OTS price $3.60

Army Chemical Research and Development Labs., Army Chemical Center, Md.
DEVELOPMENT OF A NONHAZARDOUS TECHNIQUE FOR QUANTITATIVELY EVALUATING THE INHALATION EFFECTIVENESS OF CW MUNITIONS,
by Frank C. Whitney and Mitchell E. Penn.
Aug 61, 29p. incl. illus. tables (Rept. no. CRDLR 3062)
Unclassified report

DESCRIPTORS: (*Breathing masks, *Safety devices, *Smokes, Dosage, Effectiveness, Chemical warfare agents, Aerosols, Respiration, Military personnel.) Gas masks, Aerosol generators, Smoke grenades, Pyrotechnics.

A technique for quantitatively evaluating the inhalation effectiveness of CW munitions as part of the over-all CARAMU program was investigated. A method for instantaneously generating a nontoxic cloud of fine aerosol in a nonhazardous manner was developed. A puff-type, electrically activated grenade containing a mixture of 2,4-dihydroxy benzophenone and a pyrotechnic fuel was designed and tested. An oronasal mask was employed as one of the primary elements of the system. Data obtained from laboratory experiments on the fine aerosol cloud-oronasal mask system are described. It was concluded that the puff-type grenade-oronasal mask system provides a technically feasible method for quantitatively evaluating the inhalation effectiveness of the cloud which would be produced by CW munitions. The system could be employed as part of the CARAMU program. (Author)

4. CHEMISTRY

AD-268 123 Div. 4, 25
(TISTM/GEC) OTS price $1.10

Louisiana State U., Baton Rouge.
IONIC ASSOCIATION AND CORRELATION BETWEEN DOUBLE LAYER STRUCTURE AND ELECTRODE KINETICS,
by Paul Delahay and Akiko Aramata. Oct 61, 8p. illus. 13 refs. (Technical rept. no. 47)
(Contract Nonr-157504)
Unclassified report

DESCRIPTORS: (*Ions, *Electrical double layers, Alkaline cells, Electrodes, Solutions,

Mercury, Mixtures, Barium compounds, Chlorides, Hydrochloric acid.) (Measurement, Reaction kinetics, Electric potential.)

The influence of ion pair formation in the bulk of solution in the correlation between double layer structure and electrode kinetics was investigated. Results are given for the reduction of iodate on mercury in alkaline solutions of varying composition. This electrode reaction was advantageous because it occurred in a range of potentials in which there was little specific adsorption of the ions involved. Application was made of the corrected Tafel plot. Correction for ionic association of the supporting electrolyte and/or ionic reactants appears in order in the correlation between double layer structure and electrode kinetics. (Author)

AD-268 124 Div. 4, 14
(TISTM/GEC) OTS price $1.10

Illinois U., Urbana.
STUDY LEADING TO THE DEVELOPMENT OF POLYMERS FOR USE IN HIGH TEMPERATURES.
Quarterly progress rept. no. 10, 1 Sep-30 Nov 61, by Therald Moeller and Antonio Vandi. 30 Nov 61, 6p. 3 refs.
(Contract DA 11-022-ORD-2956)
Unclassified report

DESCRIPTORS: (*Polymers, *Heat resistant polymers, Metalorganic compounds, Synthesis, Alkyl radicals, Amides, Phosphorus compounds, Chlorides, Sulfur compounds, Sulfones, Azo radicals.) (Bitolyls, Magnesium compounds, Bromides, Chemical reactions, Hydrolysis, Grignard reagents, Physical properties.)

Reactions of the dialkylamides of trichlorophosphazosulfuric acid with organo-metallic compounds have been continued to establish whether steric effects might be involved in these nucleophilic substitutions. Experiments indicate this to be the case, inasmuch as completely substituted products with m-tolylmagnesium bromide are obtained ony in very low yields, whereas with the o-tolyl Grignard they are practically non-existent. Some reactions of bis-trichlorophosphazosulfone and of the dialkylamides of trichlorophosphazosulfuric acid with aliphatic polyamines, with the object in view of obtaining organic-inorganic polymeric products, were investigated. (Author)

AD-268 201 Div. 4, 10
(TISTA/SEB) OTS price $12.50

Little, Arthur D., Inc., Cambridge, Mass.
STORAGE, SERVICING, TRANSFER, AND HANDLING OF HYDROGEN,
by A. W. Adkins, I. A. Black and others. May 61, 162p. incl. illus. tables, 26 refs.
(Contract AF 33(616)7330, Proj. 0(1-8119))
(AFFTC TR 61-18) Unclassified report

DESCRIPTORS: (*Hydrogen, Liquefied gases, Storage, Handling, Transportation, Hazards, Vaporization.) (Gas cylinders, Containers, Storage tanks, Pressure vessels, Pumps, Vacuum systems, Design, Pressure, Reliability, Stresses, Thermal stresses, Heat transfer, Tests.) (*Handbook, Data.)

The results of investigations into 6 technical areas pertaining to the handling of large quantities of liquid hydrogen are presented. Current availability and specifications for liquid H2 pumps are given. Operational experience is reported by the major users of these items. A test method is given for predicting the H2 gas required for the pressurized transfer of liquid H2. Known facts are reported relating to the safety and reliability of H2 gas cylinders as used in typical operations for the pressurized transfer of liquid H2. The design specifications and performance characteristics are given of gravity-fed and boosted pressure-fed vaporizers for liquid H2 transfers established as a result of an integrated program of theoretical analysis and tests. An economic comparison of systems using pumps, H2 vaporizers and high pressure H2 gas bottles to transfer liquid H2. This work represents a refinement or up-dating of that originally presented in Chapter 3 of the Handbook for Hydrogen Handling Equipment and WADC Technical Report 59-386 (AD-231 635). The results are presented of a further investigation of the single parting line coupling for vacuum-jacketed transfer lines originally reported in AD-231 635. A modified design and its performance characteristics established from tests are included. (Author)

AD-268 214 Div. 4
(TISTM/TCG) OTS price $3.60

Boston U., Mass.
SELECTED NITROPHENOLS, NITROPHENOL ETHERS AND RELATED COMPOUNDS OF THE BENZENE SERIES TOGETHER WITH ANALOGOUS COMPOUNDS IN THE PYRIDINE SERIES.
Final rept., 1 Sep 60-30 Sep 61, by J. Philip Mason, Harry L. Hennessy and Raymond G. McInnis. 30 Sep 61, 34p. incl. illus.
(Grant no. DA-CML-18-108-61-G-3)
Unclassified report

DESCRIPTORS: (Benzenes, *Nitrobenzenes, *Nitrophenols, *Ethers, Methyl radicals, Carbazoles, Bromides, Heptanes, Hydroxides, Phenoxy radicals, Nitro radicals, Hexanes, Octanes, Methanes.) (Sodium compounds, Malonaldehydes.) (Cyano radicals, *Pyridines.) (Acetals, Oximes.) Synthesis.

The preparation of a series of phenols, phenol ethers, and related compounds are reported. Improved procedures for the preparation of 3,5-bis-(dimethylcarbamyloxy)-nitrobenzene and 3-hydroxy -5-dimethylcarbamyloxynitrobenzene are included. In addition, a start has been made on the preparation of pyridine analogues of the benzene derivatives previously made. (Author)

AD-268 246 Div. 4
(TISTM/TCG) OTS price $8.60

Hebrew U. (Israel).
SOLID STATE CHEMICAL REACTIONS (WITH SPECIAL REFERENCE TO THE KINETICS OF THE REACTION OF INORGANIC OXIDANTS WITH POLY-DIVINYLBENZENE),
by Saul Patai and Harold Cross. July 61, 93p. incl. illus. tables, 65 refs. (Technical scientific note no. 2)
(Contract AF 61(052)143)
(ARL-218) Unclassified report

DESCRIPTORS: (Polymers, Vinyl radicals, *Benzenes and Ethyl radicals, Styrenes, *Polycyclic compounds, Solids, Chemical reactions,

Oxidation, *Reaction kinetics.) (Oxidizers, Potassium compounds, Perchlorates, Chlorates, Bromine compounds, Oxides, Iodates, Selenium compounds, Dioxides, Combustion.) (Catalysts, Inorganic substances, Oxides, Powder metals.)

The heterogeneous reaction in the solid phase of various high melting organic substances with solid oxidants in the presence of catalysts was investigated. The oxidants were KClO4, KBrO3, KNO3, KClO3, KIO3, chloranil and SeO2. The substrates were polycyclic aromatic compounds and polymers, in particular a co-polymer of p-divinylbenzene and p-ethylstyrene. A large number of high-melting substances, including inorganic salts, oxides, and metal powders were tried as catalysts. Generally, Lewis acids (Al2(SO4)3, FeCl2, etc.) catalyzed the reaction, while basic substances (Na2CO3, LiOH, etc.) inhibited it. The empirical equation dx/dt = k (a-x)/x to the 2nd power/3 fitted the kinetic curves for the catalyzed KClO4, KIO3 and KBrO3 oxidations of pDVB; and the zero order equation dx/dt = k fitted the kinetic data for the catalyzed KClO3 oxidation of pDVB. (Author)

AD-268 247 Div. 4
(TISTM/TCG) OTS price $4.60

Hebrew U. (Israel).
SOLID STATE CHEMICAL REACTIONS (WITH SPECIAL REFERENCE TO THE KINETICS OF THE REACTION OF INORGANIC OXIDANTS WITH POLY-DIVINYLBENZENE), by Saul Patai and Michael Albeck. Sep 61, 47p. incl. illus. tables (Technical Scientific note no. 3)
(Contract AF 61(052)143)
(ARL-219) Unclassified report

DESCRIPTORS: (Polymers, Vinyl radicals, *Benzenes and Ethyl radicals, Styrenes, *Polycyclic compounds, Solids, Chemical reaction, Oxidation, *Reaction kinetics.) (Oxidizers, *Potassium compounds, *Sodium compounds, *Perchlorates, Chlorates, Bromine compounds, Oxides, Combustion.)

A study was made of the heterogeneous oxidation reaction between a copolymer of 40% p-divinylbenzene and 60% p-ethylstyrene (p-DVB, dec. 440-460 C without melting) and various inorganic oxidants such as: KClO4, NaClO4, KClO3, KBrO3, and KIO3. Experiments were carried out with tablets prepared from various oxidant-substrate mixtures. In some cases the physical instability of the tablets (especially of those containing a high percentage of pDVB) limited the oxidant-substrate ratios (KIO3-pDVB tablets containing more than 12% pDVB disintegrated on handling). Preliminary experiments were carried out measuring the ignition times at various temperatures and in open tubes. (Author)

AD-268 356 Div. 4
(TISTM/TCG) OTS price $2.60

University of Southern Calif., Los Angeles.
STUDY OF THE PROPERTIES OF MICELLES.
Final summary rept., 1 Apr 51-30 Nov 61, by Karol J. Mysels. Nov 61, 24p. 40 refs.
(Contract Nonr-27400, Proj. NR 356-254)
Unclassified report

DESCRIPTORS: (*Colloids, Surface properties, Physical chemistry, Theory, Solutions.) (Tracer studies, Electrophoresis, Diffusion, Electrical properties, Conductivity, Thermodynamics, Density, Crystal structure.) (Sodium compounds, Silver compounds, *Laurates, *Sulfates.)

Research was conducted toward interpreting measurements on micelles, the critical micelle concentration, and the forces governing the formation of micelles. Tracer, electrophoresis, diffusion, light scattering, and conductivity methods of measurement are discussed. The collodoidal electrolytes studied included Na and Ag salts of lauryl, decyl, and tetradecyl sulfates. The structure of the micelle, the critical micelle concentration, and the dilute region are also discussed. The new techniques, interpretations, and data obtained considerably clarified the facts about the behavior of solutions of association colloids. It appears that the main difficulty is determining what the monomers are doing.

AD-268 379 Div. 4
(TISTA/SEB) OTS price $7.60

Becco Chemical Div., Food Machinery and Chemical Corp., Buffalo, N. Y.
STORAGE OF 90% AND 98% BY WEIGHT HYDROGEN PEROXIDE IN SEALED CONTAINERS FOR EXTENDED PERIODS.
Final rept., 15 Dec 60-15 July 61, by J. C. McCormick, A. Lijewski, and G. Carnine. Nov 61, 71p. incl. illus. tables, 11 refs.
(Propulsion department rept. no. 3504-7)
(Contracts AF 04(611)6342, Proj. 3148 and AF 33(616)6732)
(SSD TR 61-29) Unclassified report

DESCRIPTORS: (Hydrogen compounds, *Peroxides, Decomposition, Storage, *Containers, Tests, Test methods.) (*Storage tanks, Cylinder lines, Absorption, Bleaching agents, Design.) (Pneumatic devices, Containers.)

Storage of H2O2 in sealed storage containers was studied. Four grades of Becco H2O2 were evaluated: Commercial 90% by weight H2O2, propulsion 90% by weight H2O2, Commercial 98% by weight H2O2, and propulsion 98% by weight H2O2, in 1 gal capacity TFE Teflon bladders contained in mild steel test tanks at 70-72 F for 5 months, 120 F for 7 days, and 165 F for 72 hr. The bladders were not as compatible as desired due to bleaching and crack development experienced with this dispersion-type Teflon. Tests showed the O loss from the H2O2 during the storage period can be decreased by improved passivation techniques, surface pre-treatment techniques and improved stabilizers for the H2O2. An O absorbent bag in the H2O2 tank proved nonrewarding due to breakdown of the absorbent solution. The most promising test results were obtained with the 98% Propulsion H2O2 containing stabilizer P. (Author)

AD-268 439 Div. 4, 15
(TISTP/TL) OTS price $1.10

Lockheed Aircraft Corp., Sunnyvale, Calif.
A METHOD FOR THE DETERMINATION OF A, n, AND I, by Robert D. Wales. Sep 61, 7p. incl. illus.
(Rept. no. 6-90-61-72)
Unclassified report

DESCRIPTORS: (*Electrochemistry, Electrodes, Chemical reactions.) (Polarization, Electric currents, Density, Cathodes, Electric discharges, Electric potential, *Voltage.) (Algebra, Functional analysis.) Fuel cells, Corrosion.

Interest has increased in electrode reactions having very low chemical polarizations and in the values of the transfer coefficient A, the number of electrons involved in the half reaction n, and the exchange current density I for these reactions. Such interest is pertinent to the investigation of fuel cells and corrosion. A method is presented for evaluating A, n, and I by applying the general polarization equation for a net cathodic slow discharge rate-controlling reaction and the two limiting equations to the polarization data obtained experimentally from an electrode reaction. (Author)

AD-268 637 Div. 4, 25, 30
TISTM/GEC) OTS price $2.00

American Oil Co., Whiting, Ind.
DETERMINATION OF IRRADIATION PRODUCED TRIPLET EXCITATION BY FLASH SPECTROSCOPY.
Rept. for Feb 60-May 61, on The Chemistry and Physics of Materials,
by John D. McCollum and W. A. Wilson. Aug 61, 67p. incl. illus. tables, 43 refs.
(Contract AF 33(616)7089, Proj. 7360)
(ASD TR 61-170) Unclassified report

DESCRIPTORS: (*Excitation by Electron bombardment, Solutions, *Acetyl radicals, *Anthracenes, *Phenanthrenes, *Napthalenes, Organic solvents, Hydrocarbons, Cyclohexanes, Benzenes.) (Test methods, Optics, Absorption, Spectrographic analysis, Ultraviolet spectroscopy, Photoelectric cells, Photolysis, *Radioactive decay, Temperature, Dosage.)

Triplet excited states accompanying pulsed electron irradiation of solutions of anthracene, phenanthrene, naphthalene and 9-acetylanthracene were detected by flash absorption spectroscopy. G(triplet) for anthracene is 0.5 for a dose of 10 to the 18th power ev/g and a dose rate of 10 to the 23rd power ev/g-sec. Energy transfer from the solvent and subexcitation electron impact appeared to be important in triplet formation. Decay rates for the above triplets were of the ordered 1/10 to the 3rd power/sec in paraffin oil and 1/10 to the 4th power/sec in cyclohexane and benzene. The first order rate constants increased with dose and temperature. The triplet decay process was interpreted as diffusive free radical quenching by radicals produced simultaneously with triplets during irradiation. (Author)

AD-268 646 Div. 4
(TISTM/EJH) OTS price $2.50

Frankford Arsenal, Philadelphia, Pa.
DETERMINATION OF NITROGEN IN NITROCELLULOSE BY INFRARED SPECTROPHOTOMETRY,
by Harry Levitsky and George Norwitz. Sep 61, 19p. incl. illus. 42 refs. (Test rept. T62-3-1)
Unclassified report

DESCRIPTORS: (*Nitrocellulose, *Nitrogen, Determination, Infrared spectroscopy, Spectrographic analysis, Test methods.) (Organic solvents, Furan.) *Bibliography.

Previous IR studies of nitrocellulose and attempts to determine nitrocellulose and the N content of nitrocellulose by IR are reviewed. An IR method for the determination of N in nitrocellulose is proposed whereby the sample is dissolved in tetrahydrofuran by standing overnight and the transmittance of the band at 6 microns measured. Various factors affecting the method were considered. The results for the proposed method compare well with the results obtained by the nitrometer method. The precision of the method is about ±0.09%. (Author)

AD-268 648 Div. 4, 25, 14
(TISTP/GRW) OTS price $.50

Directorate of Materials and Processes, Aeronautical Systems Div., Wright-Patterson Air Force Base, Ohio.
A STUDY OF THE INFRARED SPECTRA OF SOME BRANCHED CHAINED ALIPHATIC BROMIDES AND IODIDES.
Rept. for June 59-Sep 60 on Materials Analysis and Evaluation Techniques,
by Neil T. McDevitt. Sep 61, 14p. incl. illus. 10 refs.
(Proj. 7360)
(ASD TR 61-202) Unclassified report

DESCRIPTORS: (*Aliphatic compounds, *Bromides, *Iodides, Spectrographic analysis, Infrared spectroscopy, Infrared spectrophotometers.) (*Organic materials, *Carbon compounds, *Halides, Vibration, Chemical bonds, Molecular isomerism, Molecular rotation.) (Materials, Physical properties, Chemical properties.)

The fundamental vibration of the carbon halide stretching frequency in aliphatic compounds may occur at more than one frequency for the same compound. These so called extra frequencies are due to the different rotational isomers of the compound. Identification of the various branched chained aliphatic mono halides can be obtained from the study of the frequencies of their individual rotational isomers. (Author)

AD-268 721 Div. 4
(TISTM/GEC) OTS price $2.60

Oklahoma State U., Stillwater.
ACTIVITIES IN THE TRANSITION METAL CHLORIDES IN AQUEOUS HYDROCHLORIC ACID SOLUTIONS.
Final rept., 20 Sep 56-19 Oct 60,
by Tom E. Moore. Nov 61, 27p. incl. illus. tables, 19 refs.
(Contract DA 23-072-ORD-1057, DA Proj. 5B99-01-004)
(AROD rept. no. 1629:2)
Unclassified report

DESCRIPTORS: (Thermodynamics, *Solutions, Mixtures, Chlorides, *Transition elements, *Iron compounds, *Copper compounds, Salts, *Electrolytes, Hydrochloric acid, Dissociation, Solvates, Complexions.)

The thermodynamic activities of the three solution components have been determined at 25 degrees for CuCl2, FeCl2, and FeCl3 in mixtures with HCl at constant concentration. The salt concentration was varied in each series of mixtures from 0 to saturation. For both CuCl2 and FeCl2 three series were studied having HCl molalities of 4.70, 7.00, and 9.00. A single series of solutions containing 7.00 molal HCl and FeCl3 was investigated. Measurements were

made of the HCl and H2O vapor pressures by the gas transpiration method, and the activity of the nonvolatile salt was calculated by integration of the Gibbs-Duhem equation. Data are presented for the CuC12 and FeC12 systems by empirical equations determined by the method of least squares. The results of the study of the FeC13 system are tabulated. (Author)

AD-268 725 Div. 4
(TISTM/EJH) OTS price $2.60

Naval Research Lab., Washington, D. C.
CONSTITUTIONAL EFFECTS ON ADHESION AND ABHESION,
by W. A. Zisman. 29 Nov 61, 28p. incl. illus. tables, 62 refs. (NRL rept. no. 5699)
Unclassified report

DESCRIPTORS: (Liquids, *Solids, Organic materials, Polymers, Surfaces, Surface properties, Adsorption, Monomolecular films, Thin films, *Adhesion, Surface tension.) (*Adhesives, Joints, Theory.)

The effect of varying the chemical constitution of a material on its ability to adhere may be determined to a good first approximation by the nature and packing density of the atoms or molecular radicals in the solid surface. This general conclusion was established by experiments on the wetting of liquids and solids, by the effect of the constitution of polymeric solids on friction, and by the overriding effect of monomolecular adsorbed films on adhesion. The reversible work of adhesion W sub A of a liquid to a low-energy solid can be calculated approximately from the contact angle and liquid surface tension. Both W sub A and the maximum capillary rise in pores and crevices are parabolic functions of the liquid surface tension. The resulting data are discussed in terms of surface constitutive effects, changes in W sub A and in the internal stress concentrations developed as the adhesives solidify. (Author)

AD-268 740 Div. 4, 2
(TISTP/WH) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
NEW INVESTIGATIONS OF THE ALLEGED METEORITE FROM IGAST, ESTONIA,
by John A. O'Keefe and Paul D. Lowman, Jr.
Dec 61, 6p. incl. illus. table, 19 refs. (NASA Technical note D-1151)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1151.

DESCRIPTORS: (*Meteors, Chemical analysis, Minerals.)

The results are presented of a reinvestigation of the object which allegedly fell at Igast, Estonia, in 1855, and which may be the only example of a meteorite with the chemical composition of a tektite. It is concluded that generally quoted opinions of the artificial nature of this object are based on spurious samples, specifically melted brick andquartz basalt porphyry distributed by a Russian collector. Possibly genuine specimens from this observed fall are in the British Museum, the Paris Museum, and perhaps at the University of Dorpat, Estonia. It is recommended that these specimens be re-examined and that a search for similar objects be made. (Author)

AD-268 787 Div. 4, 25, 30
(TISTM/GEC) OTS price $.75

New York State Coll. of Ceramics, Alfred U.
CORRELATION BETWEEN VARIOUS PHYSICAL AND CHEMICAL PROPERTIES OF OXIDE SURFACES AND THEIR CONSTITUTION.
Rept. for Dec 58-Nov 60, on Surface and Interface Phenomena of Matter,
by Thomas J. Gray, Samuel F. Hulbert, and David Benson. Sep 61, 14p. incl. illus.
(Contract AF 33(616)6188, Proj. 7022)
(WADD TR 60-900) Unclassified report

DESCRIPTORS: (Solids, Surface properties, *Semiconducting films, Thin films, *Oxides, Sulfides, Mathematical analysis, Mathematical prediction, High temperature research.) (Physical properties, Chemical properties.) (Test equipment, Electron diffraction analysis, X-ray diffraction analysis, Mass spectroscopy, *Mass spectrometers.)

A study has been inaugurated to elucidate the correlation between physical and chemical properties of oxide and other surfaces and their constitution. A mass spectrometer is under construction to investigate the kinetic aspects of surface properties at high temperature under various incident radiations or under molecular beam impact. Preliminary work using associated equipment concerns the preparation and modification of thin films of oxide by metal evaporation and oxidation techniques during the course of which oxidation characteristics are studied. (Author)

AD-268 861 Div. 4
(TISTM/TCG) OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
HYDROGEN OVERVOLTAGE ON POROUS IRON AND IRON-NICKEL CATHODES IN ELECTROLYSIS OF A SODIUM CHLORIDE SOLUTION,
by I. B. Barmashenko and L. A. Gorbachevskaya.
14 Dec 61, 15p. incl. illus. table, 23 refs.
(Trans. no. FTD-TT-61-134 of Izvestiya Vysshikh Uchebnykh Zavendeniy SSSR, Khimiya i Khimicheskaya Tekhnologiya 4:699-706, 1960)
Unclassified report

DESCRIPTORS: (*Electrolysis, *Sodium compounds, *Chlorides, Hydroxides, Solutions.) (Hydrogen, Voltage on *Porous metals, Iron, Iron alloys, Nickel alloys, *Cathodes (Electrolytic cell), Electrodes, Test methods.) USSR.

H overvoltage (eta H2) was investigated on smooth Fe and porous, annealed and unannealed Fe and Fe-Ni electrodes during electrolysis of a NaCl solution in the electrolyte with a stationary elctrolyte at 20 to 80 C and current densities of 100 to 5000 amp/sq. m. Eta H2 on the porous electrodes increased as the current density increased. On porous annealed electrodes, eta H2 is somewhat higher than on unannealed and less than on smooth ones by 0.15 to 0.2 v. On porous annealed Fe-Ni electrodes, eta H2 is less than on a smooth one by 0.4 v. The temperature coefficient of eta H2 is negative at various current densities, positive for porous Fe electrodes at 60 to 80 C and higher than for smooth ones; with a increase in current density it is increased, while at increased temperature it is somewhat lowered. The results of experiments on measuring eta H2 on Fe-Ni porous electrodes with flow-through and stationary electrolytes

are in good agreement. Cathodes, made by powder metallurgy methods, of powdered Fe, 3 to 4 mm thick and with a pressed layer of a mixture of powders (Ni 80% - Fe 20%, 1 to 2 mm thick), were recommended for industrial electrolysis of NaCl and NaOH solutions. (Author)

AD-268 885 Div. 4, 20
(TISTM/REB) OTS price $1.60

Nuclear Defense Lab., Army Chemical Center, Md.
THE IDENTIFICATION OF SOME PRODUCTS PRODUCED ON STORING TRICHLOROETHYLENE,
by Ronald A. Sasse, Nathan Klein and James Harris. Aug 61, 13p. incl. tables, 10 refs.
(Rept. no. NDL-TR-10)

Unclassified report

DESCRIPTORS: (*Radiochemistry, *Vinyl chlorides, Storage, Acids, Production.) (Hydrochloric acid, Glyoxylic acid, Identification.) Dosimeters.

Trichloroethylene, stored for an extended period in contact with aqueous NaOH, was found to acidify pure water. Experiments were carried out to determine whether this effect was due to spontaneous hydrolysis or to extraction of acids produced during storage. Samples of stored trichloroethylene and of freshly purified trichloroethylene were stirred with conductivity water, and pH was measured as a function of time. Freshly purified trichloroethylene did not decrease the pH of the water. The rate and degree of extraction of acids from the stored trichloroethylene varied with the initial pH. Hydrochloric and glyoxylic acids were identified among the acids produced during extended storage of trichloroethylene with base. (Author)

AD-268 897 Div. 4
(TISTM/GEC) OTS price $1.60

Army Chemical Research and Development Labs., Army Chemical Center, Md.
THE SYNTHESIS OF OPTICALLY ACTIVE ALKYL ALKYLPHOSPHONOCHLORIDATES,
by Herbert S. Aaron, Roy T. Uyeda and others. July 61, 18p. incl. illus. 24 refs. (Rept. no. CRDLR 3075)

Unclassified report

DESCRIPTORS: (Synthesis, Alkyl radicals, *Phosphonic acids, *Chlorides from Acids or Sodium compounds, Salts and Phosgene, *Stereochemistry.) *Phosphorus compounds.

An investigation was made of the reaction of phosgene with optically active O-alkyl alkylphosphonothioic acids and with their Na salts. The reaction of phosgene with optically active O-ethyl ethylphosphonothioic acid gave racemic ethyl ethylphosphonochloridate. When sodium salt of the (-)-acid was used, the (+)-chloridate was obtained. (+)-Isopropyl methylphosphonochloridate was similarly obtained from the sodium salt of (-)-O-isopropyl methylphosphonothioic acid. The stereochemical course of the reaction could not be varied whether run in hexane-phosgene, acetone-phosgene, or dioxane-phosgene media. Optically active dialkyl dialkylthionopyrophosphonates were formed as by-products of these reactions. The chloridates were optically unstable and were studied in subsequent reactions without undue delay. (Author)

AD-268 898 Div. 4
(TISTM/GEC) OTS price $1.60

Army Chemical Research and Development Labs., Army Chemical Center, Md.
THE STEREOCHEMISTRY OFASYMMETRIC PHOSPHORUS COMPOUNDS: DISPLACEMENT REACTIONS OF OPTICALLY ACTIVE ISOPROPYL METHYLPHOSPHONOCHLORIDATE,
by Herbert S. Aaron, Roy T. Uyeda and Harold F. Frack. July 61, 12p. incl. illus. 23 refs.
(Rept. no. CRDLR 3076)

Unclassified report

DESCRIPTORS: (*Stereochemistry, *Displacement reactions, *Propyl radicals, *Methyl radicals, *Phosphonic acids, *Chlorides.) (Chemical reactions with Hydrogen compounds, Sulfides, Propyl radicals, Thiols, Alkoxy radicals.) *Phosphorus compounds.

The displacement reactions at the asymmetric atom was investigated. Based on the correlation of the configurations of the products obtained from the reactions of optically active isopropyl methylphosphonochloridate with H2S, n-propyl mercaptide, and ethoxide ions with that obtained from the reaction of optically active O-isopropyl S-methyl methylphosphonothioate with ethoxide ion, it was concluded that displacement reactions at the P atom occur with predominant inversion of configuration in these systems. It was further concluded that the formation of (-)-isopropyl methylphosphonochloridate from the reaction of phosgene with the sodium salt of (+)-O-isopropyl methylphosphonothioic acid also takes place with inversion of configuration. (Author)

5. COMMUNICATIONS

AD-268 128 Div. 5
(TISTW/DLW) OTS price $1.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
AUTOMATIC ERROR-DETECTION SYSTEM FOR TOLL-GRADE TELEPHONE CIRCUIT DATA TRANSMISSION,
by W. G. Schmidt. 27 Nov 61, 11p. illus. (Rept. no. 25G-5)
(Contract AF 19(604)7400)

Unclassified report

DESCRIPTORS: (*Data transmission systems, Digital systems, Telephone signals, *Telephone communication systems, Coding, Errors, Detectors, Automatic, Design, Reliability.) (Data transmission systems, Signal-to-noise ratio, Monitors, Test equipment.)

A machine was designed for automatic error detection in digital data transmissions over toll-grade telephone circuits. Because of the coding techniques used, the data link error rate is primarily a function of terminal equipment reliability and several other factors, including the synchronization between transmitter and receiver. The general system, the logical design considerations, the hazards encountered, and the debugging and test methods used are described. Results indicate that the implementation was successful. (Author)

AD-268 140 Div. 5, 12
(TISTA/WAW) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
PROJECT ECHO-HORN-REFLECTOR ANTENNA FOR SPACE COMMUNICATION,
by A. B. Crawford, D. C. Hogg and L. E. Hunt. Dec 61, 22p. incl. illus. tables (NASA Technical note D-1131)
(In cooperation with Bell Telephone Laboratories)
Unclassified report

The substance of this paper was published in the Bell System Technical Journal, vol. 40, July 61. Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1131.

DESCRIPTORS: (*Satellite vehicles, Balloons, Communication systems, Ground support equipment, Radio equipment, Electronic equipment, *Microwave equipment, Radio receivers, Antennas, *Antenna horns, Antenna radiation patterns, Design, Mathematical analysis, Differential equations, Integral equations.) S band.

The mechanical features are described of the horn-reflector antenna used for receiving signals reflected from the Project Echo balloon satellite. Also presented in some detail are the electrical characteristics (radiation patterns and gain) measured at a frequency of 2390 Mc. Theoretically derived characteristics which agree very well with the measurements are included. Details of the calculations are given in the appendices. (Author)

AD-268 141 Div. 5, 12
(TISTA/WAW) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
PROJECT ECHO-STANDBY RECEIVER SYSTEM,
by L. U. Kibler. Dec 61, 18p. incl. illus. (NASA Technical note D-1133)
(In cooperation with Bell Telephone Laboratories)
Unclassified report

The substance of this paper was published in the Bell System Technical Journal, v. 40, no. 4, July 1961.

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1133.

DESCRIPTORS: (*Satellite vehicles, Communications systems, Radio communication systems, Ground support equipment, *Radio receivers, Radio equipment, Microwave equipment, *Parametric amplifiers, Microwave amplifiers, Electronic equipment, Design.) S band.

The Echo I satellite receiving system at the Bell Telephone Laboratories facilities at Holmdel, New Jersey, required a 2390-Mc standby receiver system to maintain operation during possible failures of the primary maser receiver. Details of the two matched parametric amplifiers used to provide the standby receiver are described. The use of this system in the initial Moonbounce experiments and in Project Echo is described. Details of an emergency operation at the beginning of a balloon pass are also presented. (Author)

AD-268 265 Div. 5
(TISTE/CRJ) OTS price $9.10

Page Communications Engineers, Inc., Washington, D. C.
INSTRUCTION MANUAL FOR CONVERSION OF NORLANT FSK-2 AND FGC-5 EQUIPMENT TO 8-CHANNEL OPERATION. Aug 61, 104p. incl. illus. (Rept. no. PCE-M-8364A)
(Contract AF 30(635)21745)
Unclassified report

DESCRIPTORS: (*Radio communication systems, *Frequency shift keyers, *Multiplex transmission, Diversity reception, *Telegraph systems, *Radio teletype systems, Teletype systems, Instruction manuals, Radio equipment, Circuits, Electronic circuits.)

Instructions are given for the conversion of the NORLANT radio and multiplexing equipment from 2, 3, or 4 channels of 60-wpm teletype information into a 4-, 6-, or 8-channel system. The conversion is accomplished by increasing the bandwidth and improving the performance of the FSK-2 receiver and by combining two 4-channel FGC-5 units into a single 8-channel unit. No changes are necessary in the FSK-2 exciter. (Author)

AD-268 296 Div. 5, 8
(TISTP/WA) OTS price $2.60

Research and Advanced Development Div., AVCO Corp., Wilmington, Mass.
RECEPTION OF WWV IN ARCTIC DURING IONOSPHERIC DISTURBANCE.
Scientific rept. no. 13 on Research Concerning Forecasting Anomalous Propagation at High Latitudes,
by John R. Herman and Geoffrey E. Hill. Oct 61, 34p. incl. illus. 8 refs. (Technical rept. no. RAD-TR-61-33)
(Contract AF 19(604)4092)
(AFCRL-950) Unclassified report

DESCRIPTORS: (*Radio transmission, High frequency, *Periodic variations, Canada.) (Radar transmission, Interference, Ionosphere, Aurorae.)

Reception characteristics of transmitter station WWV (from 2.5 to 25 mc) at five Canadian stations are shown to have regular diurnal, seasonal, latitudinal, and frequency variations on ionospherically quiet days. A detailed comparison of reception quality and ionospheric parameters during a disturbed period shows that conditions on different frequencies and propagation paths are closely related to the morphology of the ionospheric disturbance. On disturbed days, reception of the lower WWV frequencies (from 2.5 to 10 mc) in polar latitudes is affected primarily by polar cap and auroral zone absorption, while that of the higher frequencies (from 15 to 25 mc) is affected primarily by depressed F2 critical frequencies and sporadic E support. (Author)

AD-268 351 Div. 5, 8
(TISTE/CRJ) OTS price $8.10

PRD Electronics, Inc., Brooklyn, N. Y.
SPEECH BANDWIDTH COMPRESSION SYSTEM (SCANNING

FILTER).
Final rept. no. 4, 1 July 60-30 Sep 61,
by A. P. Albanese, N. Wand and others. Sep 61, 82p. incl. illus. tables, 4 refs. (Rept. no. 341.0911FR)
(Contract DA 36-039-sc-85140, Proj. 3B-31-01-001)
Unclassified report

DESCRIPTORS: (Speech, *Speech transmission, Speech representation, *Voice communication systems, *Band-pass filters, Intelligibility, Effectiveness, Statistical analysis, Coding.)

Efforts concern the analysis, experimentation and fabricational activity on a time-frequency scanning speech compression system. A statistical analysis was made to determine the scanning waveforms based on articulation scores for selected zero crossings of infinitely clipped speech. In addition, an empirical approach using sawtooth, triangular, sine-wave and rectified sine-wave scans was employed to determine the sampling scan and rates which would yield maximum articulation. Experimentation shows that using an Autovox for reverberation improved articulation. The concept was initiated of a speech compression system using 2 filter scans to intercept formant changes and yield maximum articulation. (Author)

AD-268 415 Div. 5
(TISTE/CDM) OTS price $21.00

Continental Electronics Mfg. Co., Dallas, Tex.
RADIO TRANSMITTING SET AN/FRT-32 (XC-1).
Final engineering rept., May 54-Jan 60,
by W. D. Mitchell. Jan 60, 372p. incl. illus.
(Contract DA 36-039-sc-64440)
Unclassified report

DESCRIPTORS: (*Radio transmitters, Design, *Radio communication systems, Very high frequency, Sidebands, Circuits.) (Communication equipment, Modulators, Radiofrequency oscillators, Radiofrequency amplifiers, Dummy loads, *Radio equipment, Electronic circuits.)

The technical aspects of the development of radio transmitting set AN/FRT-32 (XC-1) are presented on a task by task or phase by phase basis. This equipment is an amplifier capable of long range communications, rated at a nominal cw output of 300-kw average power and a minimum of 300-kw peak power for single-sideband communications systems. Radio transmitting set AN/FRT-32 consists of the 300-kw VHF amplifier group, the 50-kw VHF amplifier group, the 16-kw VHF amplifier group and the oscillator modulator group. Radio transmitting set AN/FRT-34 consists of the 50-kw VHF amplifier group, the 16-kw VHF amplifier group and the oscillator modulator group. The equipment used in both radio transmitting set AN/FRT-32 and radio transmitting set AN/FRT-34 is discussed. This equipment was designed for use in a ground radio transmitting set. The oscillator modulator group is used as an exciter for the 16-kw VHF amplifier group, which may be used as a separate 16-kw transmitter or as a driver for the 50-kw VHF amplifier group or for the 300-kw VHF amplifier group. (Author)

AD-268 428 Div. 5, 8
(TISTE/NTM) OTS price $3.60

Electro-Mechanical Research, Inc., Sarasota, Fla.
DEMULTIPLEXER-MULTIPLEXER TD- ( )/GSC.
25 Oct 61, 26p. incl. illus.
(Contract AF 30(602)2357)
(RADC TR 61-251, suppl. to RADC TN 61-90, AD-258 729) Unclassified report

DESCRIPTORS: (*Multiplex transmission, *Telephone communication systems, Design.) (*Communication systems, *Voice communication systems, Speech, Speech transmission, Electronic circuits, Delay circuits, Delay lines, Synchronizers, Signal-to-noise ratio, Intelligibility, Reliability, Maintenance.)

The development is presented of a practical technique for implementing a system for the simultaneous transmission of 3 telephone conversations over a single telephone line using reiterated speech principles. The completion of developmental models provides a system developed to a degree satisfactory for further laboratory experiment. (Author)

AD-268 452 Div. 5, 12
(TISTE/CDM) OTS price $3.60

National Aeronautics and Space Administration, Washington, D. C.
PROJECT ECHO - RECEIVING SYSTEM,
by E. A. Ohm. Dec 61, 30p. incl. illus. tables, 11 refs. (Technical note no. D-1130)
(In cooperation with Bell Telephone Labs., Whippany, N. J., Contract NASw-110)
Unclassified report

Also available from National Aeronautics and Space Administration, Washington 25, D. C.

DESCRIPTORS: (*Satellite vehicles, *Radio communication systems, *Radio relay systems, *Balloons, Reflectors, Voice communication systems, Communication equipment.) (*Radio receivers, Ultra high frequency, *Microwave relay systems, Masers, Parametric amplifiers, Detectors, Frequency modulation, *Radio relay stations, *Ground support equipment, Waveguides.)

A tracking horn-reflector antenna, a maser preamplifier (and standby parametric preamplifier), and a special FM demodulator were combined to form a low-noise receiving system which made possible the establishment of a high-quality voice circuit via the Echo I passive satellite. A description is given of the 2390-mc receiving system located at the Bell Telephone Laboratories facility in Holmdel, New Jersey. (Author)

AD-268 482 Div. 5, 25
(TISTB/LH) OTS price $8.10

Royal Inst. of Tech. (Sweden).
SPEECH ANALYSIS AND SYNTHESIS.
Summary rept.,
by C. G. M. Fant. 31 Jan 61, 1v. incl. illus. tables.
(Contract AF 61(052)342)
(AFCRL-390) Unclassified report

DESCRIPTORS: (*Voice communication systems, *Speech transmission, Speech representation, *Auditory perception, Frequency analyzers, Pitch discrimination, Spectrographic analysis.) (*Speech, Production, Identification, Analysis, Synthesis.)

This report includes:
(No title). Quarterly progress and Status rept., July-Sep 60. 15 Oct 60. (Rept. no. STL-QPSR-1/1960)

(No title). Quarterly progress and Status rept., Oct-Dec 60. 15 Jan 61. (Rept. no. STL-QPSR-2/1960)
Progress in speech research during 1960 is summarized. Among projects reported on are studies in speech sampling techniques and the design of spectrum sectioning devices. Results from studies of formant frequency measurements, formant tracking, pitch tracking, pole-zero matching, voice source regeneration, parametric synthesis of speech, and speech perception are discussed. Observations have been made on the production of nasalized sounds by means of cineradiographic and spectrographic methods. (Author)

AD-268 492 Div. 5, 8
(TISTE/CRJ) OTS price $3.60

Rome Air Development Center, Griffiss Air Force Base, N. Y.
ON THE DETECTION AND ESTIMATION PROBLEM FOR MULTIDIMENSIONAL GAUSSIAN RANDOM CHANNELS,
by J. K. Wolf. Nov 61, 26p. incl. illus. 21 refs. (RADC-TR-61-214)
(Proj. no. 4519)
Unclassified report

DESCRIPTORS: (*Communication systems, *Communications theory, Statistical analysis.) (*Radio interception, Radio receivers, Pulse analyzers.) (*Radio signals, Detection, Analysis, Mathematical analysis, Signal-to-noise ratio.) (Frequency shift keyers, Voice communication systems, Radio communication systems.)

Two problems in statistical communication theory, the detection and estimation of intelligence-carrying signals, are considered for the case of transmission through a multidimensional Gaussian random channel. Such a channel is characterized by the property that a deterministic input results in a set of received waveforms which are sample functions of Gaussian processes. For the detection problem, a receiver is found which operates on the set of received waveforms and gives as outputs, voltages proportional to the logarithm of the likelihood functions of the possible transmitted signals. For the estimation problem, it is assumed that the intelligence-carrying signal is itself a sample function of a Gaussian process and a mathematical description is presented of a receiver which has as its output the maximum a posteriori estimate of this signal. Examples are presented in which optimum receivers are found for both the detection and estimation problem. (Author)

AD-268 609 Div. 5, 28
(TISTB/LH) OTS price $1.60

Naval Research Lab., Washington, D. C.
EFFECTS OF TRANSMISSION BAND AND MESSAGE CONTEXT ON SPEECH INTELLIGIBILITY.
Final rept.,
by J. M. Pickett. 31 Oct 61, 14p. incl. illus. table, 17 refs. (NRL rept. no. 5690)
(Proj. RR 006-09-41-5351)
Unclassified report

DESCRIPTORS: (*Speech transmission, Pitch discrimination, Speech, Discriminators, Frequency analyzers, *Speech representation, *Intelligibility, Measurement.)

Measurements were made of the speech intelligibility associated with certain speech contexts and with various frequency ranges of the speech transmission band. Speech contexts of nonsense syllables and of a large set of isolated words showed essentially the same division of importance between high and low speech frequencies. The crossover frequency of equal importance was 1900 cps for nonsense syllables and 1700 cps for words. On the other hand, the high speech frequencies were much more important for transmission of words chosen from sets of only two words as contexts. Relationships between intelligibility, size of speech band, and size of message set were also measured. Over a limited range, each doubling of the size of message set required an increase of 1.7 db in the speech bandwidth in order to maintain intelligibility. (Author)

AD-268 661 Div. 5, 12
(TISTW/EET) OTS price $2.60

ITT Kellogg, Chicago, Ill.
FIXED GROUND COMMUNICATION SYSTEMS WEAPONS SYSTEM 107A-1.
Program progress rept. no. 55 for Nov 61. Nov 61, 23p.
(Contracts AF 04(647)123, and AF 04(647)312)
Unclassified report

DESCRIPTORS: (Guided missiles, Surface to surface, *Launching sites, Ground support equipment, *Communication systems, Communication equipment, Telephone communication systems, Public address systems, Maintenance, Installation, Quality control.)

AD-268 753 Div. 5, 6, 15
(TISTP/MFA) OTS price $2.60

Rome Air Development Center, Griffiss Air Force Base, N. Y.
ON THE STATISTICAL DETECTION PROBLEM FOR MULTIPLE SIGNALS,
by John B. Thomas and Jack K. Wolf. Nov 61, 16p. 22 refs. (Rept. no. RADC TN 61-182)
(Proj. 4519)
Unclassified report

DESCRIPTORS: (*Statistical analysis, *Communication systems, Information theory, *Detection, Signals, Noise, Radiofrequency filters, *Signal-to-noise ratio.) (Calculus of variations, Matrix algebra, Integral equations, Probability.)

The problem of detecting signals in noise is considered for the multiple input model, where each of the inputs can contain one of many possible signals. The detection procedure for this model becomes, in general, the testing of multiple hypotheses. Two detection criteria are examined for choosing among multiple hypotheses and it is found that, for both criteria, the decision is based on the likelihood functions for the various signals. Systems for computing likelihood ratios are examined in detail for the multiple input case. A multidimensional matched filter is considered and its relationship to the likelihood ratios is shown. Optimum signals are determined for the two-hypothesis problem. (Author)

AD-268 756 Div. 5
(TISTE/CRJ) OTS price $4.60

Radiation, Inc., Melbourne, Fla.
EXPERIMENTAL INVESTIGATION OF CHAFF TRANSMISSION IN THE 1300 TO 1800 MC FREQUENCY RANGE.
Quarterly progress rept. no. 1, 1 July-30 Sep 61, by L. H. Bauer. 30 Sep 61, 40p. incl. illus.
(Contract DA 36-039-sc-88897)
Unclassified report

DESCRIPTORS: (*Radio communication systems, *Secret communication systems, *Radio relay systems, Ultra high frequency, *Reflectors, Reliability, Design, Tests.) (*Communication equipment, Radar confusion reflectors.) (Radio signals, Radio waves, Propagation, Reflection, Scattering.)

Efforts are being made to determine the feasibility of communicating between 2 ground points via chaff clouds employing the presently available AN/GRC-50 radio relay equipment of modest power (10 watts) operating in the 1300 to 1800 mc frequency range. Experimental efforts were divided into 2 phases. Phase I utilizes an aircraft to dispense chaff for transmitter-receiver separation of 4 to 6 miles. Phase II will use rockets to dispense chaff at an altitude of 200,000 ft and equipment separation from 100 to 150 miles. Progress is reported on the preliminary design of Phase I experiment and on the erection, checkout, and calibration of the M-33C radar and AN/GRC-50 radio equipment. Also, a single chaff drop was made and the chaff cloud tracked by the radar and illuminated intermittently by the AN/GRC-50 transmitting station. The measured value of minimum detectable signal for the AN/GRC-50 receiver was -140 dbw ± 3 db. The computed value for the average S/N expected at the receiver (for a 6-mile separation between transmitter and receiver and for 10 pounds of chaff dispensed over one terminal at 12,000 ft was 26 db. Measured fall rates varied from 30 to 250 ft per minute with an average of 125 ft per minute. (Author)

AD-268 836 Div. 5, 31
(TISTW/DLW) OTS price $.75

Naval Research Lab., Washington, D. C.
SUBMARINE-RESCUE VHF/UHF RADIO TRANSMITTING BUOY, MECHANICAL DESIGN CONSIDERATIONS,
by J. Awramik, Jr. 4 Dec 61, 20p. incl. illus. 12 refs. (NRL rept. no. 5707)
Unclassified report

DESCRIPTORS: (*Radio rescue buoys, Air sea rescue beacons, Rescue beacons, Radio beacons, Automatic, Submarine signals, Very high frequency, *Radio transmitters, Distress signals, Antennas, Design, Tests.)

A radio resue buoy was developed which can be launched from the interior of a submerged submarine in distress. The buoy rises to the surface and automatically transmits a radio distress signal continuously on 243 mc. With radio direction-finding techniques, it serves to localize the area. Physical characteristics and mechanical design features are considered in terms of the limitations imposed by requirements for simple ejection, automatic operation, stable flotation, reliability of operation after long stowage, minimum maintenance, and ease of manufacture in quantity procurement. Operating life is more than 11 hours at full output of one-half watt. Estimated shelf life is in excess of 10 years. Radio-communication ranges have been achieved to essentially line-of-sight with surface vessels, and with aircraft to distances of 36, 52, and 82 naut mi at respective aircraft altitudes of 2,500, 5,000, and 10,000 ft. (Author)

AD-268 841 Div. 5, 12
(TISTA/VGW) OTS price $1.50

National Aeronautics and Space Administration, Washington, D. C.
PARTICIPATION OF BELL TELEPHONE LABORATORIES IN PROJECT ECHO AND EXPERIMENTAL RESULTS,
by William C. Jakes, Jr. Dec 61, 54p. incl. illus. tables, 14 refs. (NASA Technical note D-1127)
(In cooperation with Bell Telephone Labs., Whippany, N. J., Contract NASw-110)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1127.

DESCRIPTORS: (*Satellite vehicles, Balloons, Microwaves, Radio waves, Reflection for Communication systems, Voice communication systems, Radio communication systems, Microwave communication systems, Facsimile communication systems, Tests.) (*Radio relay systems, Microwave relay systems, Radio transmission by Amplitude modulation, Frequency modulation, Phase modulation, Sidebands.) (Radar stations, Radar tracking, Optical tracking, Satellite vehicles, Orbital flight paths.)

On August 12, 1960, Echo I was placed in oribt around the earth to demonstrate the feasibility of long-distance communication by microwave reflection from a satellite. A two-way coast-to-coast voice circuit was to be established between the Jet Propulsion Laboratory (JPL) facility in California and a station provided by Bell Telephone Laboratories (BTL) in New Jersey. Similar tests were also planned with the Naval Research Laboratory and other stations. This paper describes the general organization and operation of the Holmdel, New Jersey, station, and discusses the results of the experiments performed between the balloon launching and March 1, 1961. (Author)

6. DETECTION

AD-268 380 Div. 6, 12, 8
(TISTE/CRJ) OTS price $2.60

Florence U. (Italy).
MAINTENANCE AND OPERATION OF A DOPPLER DATA RECORDING STATION. PART II. IONOSPHERIC MEASUREMENTS.
Final rept. pt. 2,
by Pier Francesco Checcacci. Sep 60, 18p. incl. illus. tables, 12 refs.
(Contract AF 61(052)182)
(AFCRL-521, vol. 2) Unclassified report

DESCRIPTORS: (*Ionosphere, Upper atmosphere, Analysis, Radio signals, *Doppler tracking, *Satellite vehicles, Telemetering data, Meas-

urement.) (Doppler tracking, Doppler systems, Satellite vehicle trajectories, Recording systems, Italy, Maintenance, Operation.) (Telemetering data, Data transmission systems, Data processing systems.) Van Allen radiation belt, Terrestrial magnetism, Magneto-optic rotation.

Methods are described for studying the ionosphere by means of artificial satellites signals. The signals examined were those emitted by 1958 delta II. It was difficult to measure the frequency shift with great accuracy because of the pulse modulation of the signals of this satellite. By means of Faraday rotations some determinations were made of the integral electron content in the column between the satellite and the ground. It was also possible to explain the hop-propagation phenomena in agreement with the computed values. Deductions from phase and amplitude scintillation records or from fade out records were not made, but it may be useful to list the periods during which these phenomena occurred, and also to represent the corresponding positions of the satellite. These data could be utilized by comparing them with the observations made by other stations with the purpose of localizing the zone of ionospheric irregularities which caused scintillation. (Author)

AD-268 597 Div. 6
(TISTW/RD) OTS price $2.60

Institute of Science and Tech., U. of Michigan, Ann Arbor.
A VARIATIONAL FORMULA FOR THE SCATTERING FROM N CONDUCTORS,
by Charles M. McDowell. Dec 61, 18p. 4 refs.
(Rept. no. 3709-17-T)
(Contract AF 33(616)7391)
Unclassified report

DESCRIPTORS: (Scattering from Airborne, *Radar confusion reflectors and Fibers of Metals, Conductors.) (Scattering, Mathematical analysis.) (Scattering, Electromagnetic waves.)

The far-scattered electric field and the backscattering cross section of an arbitrary number of perfect conductors are given in terms of a derived vector. A stationary, scale-invariant formula for the components of this vector is obtained, and from it a variational formula for the backscattering cross section of the conductors is developed. (Author)

AD-268 638 Div. 6
(TISTW/DLW) OTS price $3.60

Naval Ordnance Lab., Corona, Calif.
PROPERTIES OF PHOTODETECTORS.
Photodetector series rept. no. 48, Aug-Oct 61, by J. D. Merriam, W. L. Eisenman, and A. B. Naugle. 15 Nov 61, 21p. incl. illus. tables (NOLC rept. no. 557)
Unclassified report

DESCRIPTORS: (*Infrared detectors, *Infrared photoconductors, *Infrared photoelectric cells, Photoelectric cells, Detectors, Materials, Sensitivity, Tests.) (Infrared optical materials, Indium compounds, Antimonides, Silicon, Thermistors, Bolometers, Lead compounds, Sulfides, Germanium, Electrical properties, Physical properties, Measurement.)

The results are presented of measurements made on 11 photodetectors. Data sheets are given on indium antimonide cells from Minneapolis Honeywell and Block Associates, Inc.; lead sulfide cells from Tupper Trent Company; thermistor bolometer cells from Barnes Engineering Company; a silicon cell from Solid State Radiations, Inc.; and a germanium cell from the Santa Barbara Research Center. (Author)

AD-268 683 Div. 6, 12, 8
(TISTP/TL) OTS price $7.60

Southwestern Industrial Electronics Co., Houston, Tex.
SEISMIC LOCATION OF MISSILE IMPACTS AT WHITE SANDS MISSILE RANGE.
Oct 61, 77p. incl. illus. tables, 45 refs.
(Contract DA 36-039-sc-87211)
Unclassified report

DESCRIPTORS: (*Seismographs, Feasibility study, *Guided missiles, Impact shock, Detection, *Seismic waves, Detector, Refraction.) (Transistors, Data, Recording devices, Instrumentation, Electronic equipment.) (Earth, Motion.)

Field tests were conducted with commercial seismic instruments to determine the feasibility of locating missile impacts on White Sands Missile Range. Results proved seismic refraction techniques reliable and accurate to within + or - 20 ft. for location of missile impacts in a mile square area of the range. Time of impact could be calculated to within a few milliseconds. The most useful signal path for accurate location of missile impacts was via the 7,300 ft. per sec. refractor. For impacts beyond the critical distance, the first arrivals were via the 14,000 ft./sec refractor layer. The loss of data from many sensors located within 2,000 feet forward of the impact point was caused by air sonicboom noise. A broader and deeper array would have enhanced accuracy in locating missiles impacts several miles from the sensors. (Author)

AD-268 701 Div. 6, 25, 15, 22
(TISTP/TL) OTS price $11.00

Goodyear Aircraft Corp., Akron, Ohio.
EXPERIMENTAL RESULUTION IMPROVEMENT RESEARCH.
Phase rept. task 5 on Filter Derivation, by D. G. Corbett. 15 Dec 61, 68p. incl. illus. tables, 5 refs. (Rept. no. GER-10268S1)
(Contract DA 44-009-eng-4733, Proj. 8F07-11-001-01)
Unclassified report

DESCRIPTORS: (*Optical filters, Design, Theory, Mathematical analysis, Sampling, Coding.) (Frequency, *Spectrographic analysis, Detection, Signal-to-noise ratio, Tests, Tables.) (Integral equations, Functions, Polynomials, Integral transforms, Statistical functions, Least squares method.) (Magnetic detectors, Mine detectors.) Feasibility studies.

A procedure for computing a physically realizable resolution improvement filter with a convolution equation system using space-domain Dirac samples of the sensor aperture is described. This type of filter calculation was selected as superior

to those using approximations of the aperture as a continuous function or those using sampling in the frequency domain. It is shown that a resolution improvement filter must contain both positive and negative terms and that the optimum design of a filter is a function of the system input signal to noise ratio. (Author)

AD-268 702 Div. 6
(TISTW/DLW) OTS price $3.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
AN ULTRASONIC RECEIVER FOR DETECTING SIGNALS OF BATS,
by Anthony Bertolini. 5 Dec 61, 16p. illus.
(Rept. no. 47G-0010, rev. 1)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: (*Bats, *Ultrasonic radiation, Ultrasonics, *Ultrasonic spectrum analyzers, Preamplifiers, Audio amplifiers, Microphones, Power supplies, Design.) (Ultrasonic radiation, Radio receivers, Acoustic detectors, Detectors, Detection.)

A portable ultrasonic receiver was designed for detecting the signals of bats and other fauna which may emit ultrasonic sounds. The receiver has a passband extending from 15 kc to 200 kc, but bandwidth selection within this interval can be obtained with the use of plug-in filters. It has a small-signal voltage gain of 78 db preceding a rectifier which envelope-detects the ultrasonic signal. Following detection is 10 db of audio voltage gain. Additional gain is provided by a preamplifier inserted between the microphone and ultrasonic amplifier. All of the power is supplied by five 1.35 volt mercury cells but D-cell flashlight batteries may be used when necessary. The total weight of the unit is 5 pounds. Author)

AD-268 727 Div. 6, 19
(TISTW/DLW) OTS price $4.60

Naval Research Lab., Washington, D. C.
MEASUREMENTS USING A POLARIZATION INSTRUMENTATION RADAR ON NAVIGATIONAL BUOYS,
by I. D. Olin and F. D. Queen. 21 Nov 61, 39p. incl. illus. tables, 6 refs. (NRL rept. no. 5701)
Unclassified report

DESCRIPTORS: (*Buoys, Floats, *Radar echo areas, Radar reflections, Measurement.) (*Radar targets, Polarization, Electromagnetic wave reflections, Tests.) (Radar equipment, Radar transmitters, X band, Instrumentation, Radar pulses, Radar signals of Test equipment, Polarization.)

A pulsed radar system for studying the polarization characteristics of targets was built which is capable of transmitting any 1 of 4 selected polarized components (V, H, R, L) while receiving all 4 simultaneously for each pulse. In addition, an amplitude technique for examining the tilt angle of the total polarized return is incorporated within the system. Measurements were made on three different standard radar navigational buoys. It was found that vertical and horizontal polarized transmission resulted in no observable depolarization in the received signal. Use of circularly polarized transmission, however, resulted in substantial depolarization in the received signal. (Author)

AD-268 746 Div. 6, 25
(TISTW/EET) OTS price $1.60

Navy Underwater Sound Reference Lab., Orlando, Fla.
TRANSDUCERS FOR HIGH PRESSURE AND LOW TEMPERATURE,
by Robert J. Bobber, Claude C. Sims and Ivor D. Groves. 28 Dec 61, 11p. incl. illus. 12 refs.
(USRL Research rept. no. 58)
Unclassified report

This report is an Unclassified version of a Confidential article that appeared in the U. S. Navy Jnl of Underwater Acoustics, 11:427-437, July 1961.

DESCRIPTORS: (*Sonar, *Transducers, Temperature, Calibration.) (*Acoustics, Measurement on Transducers.) (Transducers, Sensitivity, Pressure, Temperature, Measurement.) (Transducers, High-pressure research, Low-temperature research in Underwater sound laboratories.) (Hydrophones, Materials, Design.) Underwater sound.

The experience of the U. S. Navy Underwater Sound Reference Laboratory in making transducer calibration measurements as a function of static pressure and temperature indicates that the sensitivity of experimental sonar transducers frequently changes with the ambient conditions. Shifting resonant frequency is one of the more common and important changes. Standard calibration transducers that are stable with pressure, temperature, and time have been developed. Design considerations are given, and examples are shown. (Author)

AD-268 851 Div. 6, 8, 30
(TISTE/CDM) OTS price $3.60

Radiation, Inc., Melbourne, Fla.
TELEMETRY TRANSDUCER HANDBOOK.
Monthly progress rept. no. 7, 15 Nov-15 Dec 61,
by H. F. Fisher, Jr. 22 Dec 61, 5p. illus.
22 refs.
(Contract AF 33(616)8309, Proj. 4107)
Unclassified report

DESCRIPTORS: (Handbooks, *Telemeter systems, *Transducers, Parts catalogs.)

AD-268 880 Div. 6, 8
(TISTW/DLW) OTS price $19.75

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
A STUDY OF NANOSECOND PULSE TECHNIQUES IN RADAR TRANSMISSION,
by C. G. Bachman. 27 Feb 61, 299p. incl. illus. tables, refs. (Rept. no. UB-1426-P-1)
(Contract AF 30(602)2182, Proj. 4506)
(RADC TR 61-247) Unclassified report

DESCRIPTORS: (*Radar transmitters, Wave transmission, Microwave equipment, Broadband, Radar pulses, Pulse modulation, Pulse generators, Radiofrequency power, Radiofrequency generators, Power amplifiers, Transmission lines, Waveguide windows, Radar receivers, Analysis.) (*Microwaves, Attenuation, Propagation, Electromagnetic effects.)

A study is made of important subsystems for high energy, wide instantaneous bandwidth radar transmitters. The relative merits of direct short pulse operation and pulse compression techniques to obtain high range resolution are explored. Included are the present and predicted capabilities of pulse modulators and r-f sources, design information on electrical breakdown and attenuation of transmission lines, effects of high peak and average power on microwave window materials, and the effects of propagation parameter anomalies on wide bandwidth radar transmissions. Appropriate supporting material such as an introduction to special analytical techniques, and a survey of wideband radar receivers is also included. (Author)

7. ELECTRICAL EQUIPMENT

AD-268 222 Div. 7
(TISTE/CRJ) OTS price $3.60

Aeronca Mfg. Corp., Baltimore, Md.
FEASIBILITY STUDY AND EXPERIMENTAL MODEL OF AN OPTIMAL CONTROL SERVOMECHANISM.
Quarterly progress rept. no. 1, 15 June - 15 Sep 61,
by William S. Hare. 15 Sep 61, 20p. incl. illus.
(Contract DA 36-039-sc-87256)
Unclassified report

DESCRIPTORS: (*Servomechanisms, Control systems, Guidance, Relays, Synthesis, *Switching circuits, Mathematical analysis, Control, Stabilization, Stability.)

Research is concerned with the construction of a feasibility model demonstrating the principles of optimal discontinuous control for servo motors. The servomechanism to be constructed will be optimally designed with respect to inputs of the type, step plus ramp disturbance, and will be self adaptive to torque variations in the load. There appear to be 2 design approaches to the synthesis of the optimal switching function. One would be to construct an analog of the switching function using conventional analog computer techniques, such as logarithmic amplifiers, multipliers, dividers and other nonlinear elements to produce, in real time, subject to the state variations of the error and error rate in the phase-plane, an optimal discontinuous forcing function. A second technique is to construct the switching function faster than real time through the use of passive analog elements. This technique would run the linear plant to the origin, in the phase-plane, many times faster than real time. Noting the error and switching the forcing function will match that predicted condition. This second technique was adopted. (Author)

AD-268 235 Div. 7, 4
(TISTM/TCG) OTS price $4.60

General Electric Co., West Lynn, Mass.
RESEARCH ON LOW TEMPERATURE FUEL CELL SYSTEMS.
Special technical progress rept. no. 18, 1 June-30 Sep 61.
30 Sep 61, 41p. incl. illus. tables, 4 refs.
(Contract DA 44-009-eng-3771)
Unclassified report

DESCRIPTORS: (*Fuel cells, Electrolytic cells, Low temperature research, Design.) (Electrodes, Platinum, Carbon, Oxidation, Polarization, Adsorption, Hydrocarbons, Hydrogen.) (Electrolytes, Sulfuric acid, Potassium compounds, Hydroxides, Bicarbonates, Hydrogen ion concentration.) (Ethanes, Butanes, Methanes, Propanes, Ethylenes.) (Electrochemistry, Power supplies.)

Comparative reactivities of a group of saturated hydrocarbons were determined in Pt anode fuel cells containing both strongly acidic and strongly basic electrolytes at 25 to 65 C. Rough values of activation energy for the overall oxidation processes were calculated for high reactivities. Measurements with the series CH4, C2H6, C3H8, isobutane, neopentane show that the tertiary H in isobutane does not produce any noticeable enhancement in the anodic reactivity of this molecule. Galvanostatic studies of CH4, C2H6, C3H8, isobutane, ethylene and cyclopropane indicate that the rate of adsorption of saturated hydrocarbons on Pt black electrodes is markedly dependent upon the electrolyte. Slow adsorption occurs in the presence of bicarbonate and caustic. Ethylene and cyclopropane are more readily adsorbed than the saturated hydrocarbons, and both gases adsorb readily in the presence of acidic caustic and bicarbonate electrolytes. Steps attributable to adsorbed H appear on the saturated hydrocarbon galvanostatic oxidation curves. The adsorbed carbonaceous species from the hydrocarbons require high overvoltages for their oxidation. (Author)

AD-268 267 Div. 7
(TISTE/CRJ) OTS price $2.00

Radio Corp. of America, Somerville, N. J.
NEW CATHODE-ANODE COUPLES FOR SECONDARY BATTERIES.
Rept. for June-Dec 60, on Energy Conversion Technology,
by E. F. Uhler, J. B. Eisen, and G. S. Lozier.
Apr 61, 61p. incl. illus. tables, 122 refs.
(Contact AF 33(616)7505, Proj. 3145)
(WADD TR 61-35) Unclassified report

DESCRIPTORS: (*Storage batteries, *Cathodes (Electrolytic cell), *Anodes (Electrolytic cell), Electrolytes, Design, Life expectancy.) (Anodes (Electrolytic cell), Alkali metals, Alkaline earth metals, Aluminum, Calcium, Lithium, Magnesium, Sodium.) (Battery separators, Ceramic materials, Enamel coatings.) (Cathodes (Electrolytic cell), Metallic compounds, Oxides.)

Research was conducted to provide design criteria for long-life light-weight secondary batteries through investigations of new cathode-anode couples and their associated electrolytes and separators. The new cathode-anode couples studied had a theoretical energy-to-weight ratio of reactant materials based on the free-energy release of the reactant materials at 25 C of not less than 500 watt-hours per pound. A classification of anode and cathode materials based on similar chemical and physical properties was developed to select couples and their associated electrolytes and separators to provide design criteria for long-life light-weight secondary batteries. A molten salt solvent system was the most desirable electrolyte for the development of a secondary battery. Lithium, sodium, magnesium, calcium, and aluminum are the most desirable anode materials, on the basis of reactivity and ampere-hour capacity. (Author)

AD-268 349 Div. 7
(TISTE/NTM) OTS price $12.00

Mallory Battery Co., North Tarrytown, N. Y.
TESTING AND EVALUATION OF PRIMARY ALKALINE CELLS AND BATTERIES.
Semi-annual rept. no. 3, 1 Mar-1 Sep 61,
by Roger Goodman. 1 Sep 61, 161p. incl. illus. tables.
(Contract DA 36-039-sc-78320)
Unclassified report

DESCRIPTORS: (*Alkaline cells, *Primary batteries, Dry cells, Zinc, Mercury, Electric discharges, Storage, Temperature, Mercury compounds, Oxides, Tests, Voltage.)

Work continued on the program for initial discharge of 12R cells. Monthly EMF readings were taken on 12R cells stored at 70 F. Type 12R cells were placed in cyclic storage of 0 - 130 F for a twelve month program. Six month cells were discharged. Type 12R cells stored at 160 F were tested after 1, 2, 3, and 6 months storage. Cells stored for 3 months at 115 F were tested. Six month tests on cells stored at -20, 20, 70, and 115 F were made. Monthly EMF readings were taken on 42R cells stored at 70 F. Work continued on the program of initial discharge of 42R cells. Cells placed in storage at temperatures of from -20 to 115 F were removed for the twelve month discharge tests at the 1000 hour rate. Work was started on the program of initial discharge of 640R cells. Monthly EMF readings were taken on 640R cells stored at 70 F. Over seven thousand 640R cells were distributed among 5 storage temperatures from -20 to +160 F to provide up to 36 months of storage. (Author)

AD-268 359 Div. 7, 1, 12
(TISTW/RD) OTS price $6.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
A CLASS OF ADAPTIVE CONTROL SYSTEMS WITH SINUSOIDAL PARAMETER PERTURBATION,
by Robert B. Lackey. 1 Sep 61, 59p. incl. illus. 14 refs. (Rept. no. 1222-3)
(Contract AF 33(616)7843, Proj. 1(620-4144))
Unclassified report

DESCRIPTORS: (*Control systems, Mathematical analysis, Perturbation theory.) (Control systems, Analysis with Analog computers.) (Data processing systems, Design.) (Control systems, Human engineering.) (Control systems, Airborne, Errors.) (Phase detectors, Mathematical analysis.)

Research concerns the development of analysis methods and their application to a class of adaptive control systems. The analysis of the slow system, it is observed, is relatively easy to perform, because of the nature of the system and because of the resulting simplifications which can be made. In the analysis of the fast system, however, these assumptions were not applicable, and, a new analysis method had to be devised. The analysis methods presented are adequately suited to this class of adaptive control systems with respect to specifying the nature of the error signal (the performance criterion). Once this error signal is specified, conventional techniques may be used to evaluate system stability and performance. (Author)

AD-268 561 Div. 7
(TISTA/LSK) OTS price $1.10

Aeronautical Electronic and Electrical Lab., Naval Air Development Center, Johnsville, Pa.
STUDY OF MILITARY SPECIFICATIONS AND STANDARDS USED FOR PRIMARY D-C AIRCRAFT ELECTRIC SYSTEMS.
Final rept.,
by H. Brown. 20 Nov 61, 7p. (Rept. no. NADC-EL-61108)
(WEPTASK No. RAE50J011/2021/F012-11-001, Problem No. J45AE52-43)
Unclassified report

DESCRIPTORS: (Aircraft equipment, Direct current, *Electrical equipment, Voltage regulators, Generators, Electric switches, Electric relays, Standards, Standardization, Specifications, Handbooks, Instruction manuals.)

A study was made of various military specifications and standards used by the Army, Navy, and Air Force for the design and procurement of primary d-c electric systems for use in aircraft. The purpose was to determine where duplication and differences in equipment requirements existed among the services, and to make recommendations for any desirable improvements. The resulting recommendations are given. (Author)

AD-268 583 Div. 7
(TISTW/EET) OTS price $8.10

RCA Defense Electronic Products, Camden, N. J.
PCM COMMUTATOR.
Final engineering rept.
15 Nov 61, 79p. incl. illus. tables.
(Contract NOw 60-0124-c)
Unclassified report

DESCRIPTORS: (*Commutators, *Analog-to-digital converters, Analog systems, Magnetic cores, Memory devices, *Data processing systems, *Data storage systems, Reliability, Design, Production, Tests.) (Pulse modulation, Coding, Commutators, Switching circuits, Triggered gates, Trigger circuits.)

The PCM Commutator (pulse code modulation commutator) represents a significant advance in the state of the art in multichannel encoding. The research model employs the re-circulation technique of encoding, and is capable of performing high resolution, high accuracy analog-to-digital conversion. The unit is capable of encoding analog inputs ranging from 5 millivolts to 5 volts in amplitude and providing an output of 10 serial bits at a rate of 200,000 bits per second while maintaining an output accuracy of the order of 0.15 percent of full scale from 0 to +60 C. Although only five input channels were incorporated into the research model, the final test results indicate an actual commutator capability of 40, or more, analog input channels, each with the same high degree of accuracy and resolution of the research model. The unit is powered by a mercury cell power supply which, in addition to having a life expectancy of 10 hours, provides a precision reference voltage source, and is self-regulated. Provision is made to connect the unit to external laboratory regulated supplies for extended performance testing. (Author)

AD-268 590 Div. 7, 25, 12
(TISTE/CRJ) OTS price $9.10

General Electric Co., Schenectady, N. Y.
THERMOPILE GENERATOR FEASIBILITY STUDY. PART I.

SUMMARY.
Final rept., 1 July 57-31 Mar 60,
ed. by R. L. Gessner. Aug 60, 100p. incl. illus. tables.
(Contract AF 33(616)5281, Proj. 3145)
(WADD TR 60-22, pt. 1) Unclassified report

DESCRIPTORS: (*Thermopiles, *Generators, *Power supplies, Thermoelectricity, Satellite vehicles, Spaceships, *Electric power production, Design.) (Materials, Refractory materials, Metals, Alloys, Intermetallic compounds, Semiconductors, Thermoelectricity, Thermal conductivity, Measurement, Instrumentation.)

A research and development study was made to determine means of employing thermopile generators as sources of electrical power in future air and space weapon systems. The following major areas of work are summarized: (1) materials development, (2) junction fabrication and test, (3) thermoelectric generator applications studies, and (4) thermoelectric generator design. (Author)

AD-268 591 Div. 7, 25, 12
(TISTE/CRJ) OTS price $8.60

General Electric Co., Schenectady, N. Y.
THERMOPILE GENERATOR FEASIBILITY STUDY. PART IV. GENERATOR DESIGN.
Final rept. for 1 July 57-31 Mar 60,
ed. by R. L. Gessner. Aug 60, 84p. incl. illus. tables, 12 refs.
(Contract AF 33(616)5281, Proj. 3145)
(WADD TR 60-22, pt. 4) Unclassified report

DESCRIPTORS: (*Thermopiles, *Generators, *Power supplies, *Electric power production, Design, Satellite vehicles, Spaceships, Thermoelectricity.) (Materials, Sandwich construction, Thermoelectricity, Lead compounds, Tellurides, Thermal conductivity, Conductivity, Electrodeposition, Iron, Nickel.)

A detailed description is given of the work on junction fabrication and test and on thermoelectric generator design as applied particularly to: (1) efforts to design, build, and test a 5 watt generator model, and (2) preparation of specifications for a 100 watt solar thermoelectric generator. The actual specifications for the 100 watt solar thermoelectric generator are appended. (Author)

AD-268 730 Div. 7, 8, 25
(TISTE/CRJ) OTS price $6.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
EVALUATION OF THE INTERFERENCE-SUPPRESSING POWER CONDUCTOR.
Rept. on Y-F006-09-201, Type C,
by D. B. Clark and J. L. Brooks, 20 Dec 61, 50p. incl. illus. 13 refs. (Technical rept. no. 178)
Unclassified report

DESCRIPTORS: (*Electric insulation, Insulating materials, Electric cables, Electric wire, *Transmission lines, Power, Design.) (*Transmission lines, Electromagnetic waves, Electric fields, Interference, Attenuation, Impedance, Measurement.) (*Radio interference, Reduction.) (*Transmission lines, Impedance, Measurement.)

Field evaluation was made of a 4-mile installation of 13.2 kv, 3-phase, special interference-attenuating power line. The special line, with large magnitudes of interference at its beginning, is shown to attenuate effectively over the broad frequency spectrum to bring the noise level of the line down to the level of the natural ambient in about half of its length. Impedance measurements of the power line as a transmission line showed it to be independent of line terminations, and that considerable attenuation was present. Field intensity measurements showed that the intensity decreased rapidly in greater than inverse square with distance, indicating a field propagated along the line, with no measurable radiation away from the line. The effect of the high-permeability tape thickness on attenuation is considered theoretically and experimentally, and it shows that attenuation is proportional to the tape thickness until the thickness is of the order of one skin depth. The potential applications and limitations of the new interference-suppressing line are presented. (Author)

AD-268 751 Div. 7
(TISTM/GEL) OTS price $2.60

Naval Research Lab., Washington, D. C.
THE LEAD CALCIUM BATTERY. PART I. INTRODUCTION AND BACKGROUND.
Interim rept.,
by Jeanne Burbank and C. P. Wales. 22 Nov 61, 20p. incl. illus. tables, 14 refs. (NRL Rept. no. 5693)
Unclassified report

DESCRIPTORS: (*Storage batteries, Wet cells, Electrolytic cells, Lead compounds, Calcium compounds, Acids, Electrical properties, Polarization, Theory.)

Essential characteristics of the Pb acid cell, and particulars of full float operation in terms of the individual plate potentials and the state of charge of the cells are described. When fully charged, the current is erratic and is determined by the negative plates. This small current is just sufficient to counteract self-discharge. The positive plates in a floating cell are polarized very slightly above their open circuit voltage and do not vary with the fluctuating float current. Following discharge, the battery in float service is recharged automatically at the constant voltage selected for float. Certain restrictions are imposed upon the balance of negative and positive plate areas in the individual cells; all cells in a battery must be nearly equivalent to float simultaneously, and the cells must be capable of maintaining capacity when operating at maximum efficiency. (Author)

AD-268 835 Div. 7
(TISTW/DLW) OTS price $.50

Naval Research Lab., Washington, D. C.
TUNNEL DIODE STATIC INVERTER.
Interim rept.,
by Joseph M. Marzolf. 25 Oct 61, 8p. incl. illus. (NRL rept. no. 5706)
Unclassified report

DESCRIPTORS: (*Diodes, *Inverter circuits, *Signal generators, Magnetic cores, Waveform generators, Generators, Power supplies, Electrical networks, Design.) (Electric power production, Thermionic emission, Thermoelectricity, Fuel cells, Direct current, Transformers, Circuits, Reliability, Effectiveness.)

A simple static inverter circuit of 2 tunnel diodes and a transformer wound on a square loop magnetic core is described. Its characteristics make it particularly applicable for use with the new low-voltage, high-current unconventional dc power sources such as thermoelectric, thermionic, and fuel cell generators. In operation, the tunnel diode static inverter is reliable and stable. It is static, simple, and relatively small with no short-circuit protection needed. The output is a high-quality ac square wave at any desired design voltage. The power output is limited only by the current capabilities of the tunnel diode. The high quality of the square wave output may recommend the use of this device as a low-frequency square-wave signal generator. (Author)

AD-268 838 Div. 7
(TISTW/DLW) OTS price $1.60

Naval Research Lab., Washington, D. C.
ANALYSIS OF TUNNEL-DIODE CONVERTER PERFORMANCE.
Interim rept.,
by D. J. Hanrahan. 1 Dec 61, 15p. incl. illus. tables, 6 refs. (NRL rept. no. 5722)
Unclassified report

DESCRIPTORS: (*Diodes, *Inverter circuits, *Electronic circuits, Negative resistance circuits, Oscillators, Power supplies, Electrical networks, Design.) (Electric power production, Thermionic emission, Thermoelectricity, Fuel cells, Direct current, Circuits, Effectiveness, Tests.)

Three tunnel-diode converter circuits - the Storm and Shattuck circuit, a push-pull version, and the Marzolf circuit - are analyzed graphically to obtain waveforms for both inverter and dc converter operation. Simple expressions are found for diode efficiency in ideal dc converter operation. The efficiencies are the same except that the efficiency of the Marzolf circuit is reduced by the magnetizing current required for the square-loop core. However, the Marzolf circuit has a more nearly square waveform and would require less filtering for dc conversion. The results point up the importance of developing tunnel diodes with high peak-to-valley ratios for converter application. (Author)

8. ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-268 144 Div. 8, 12, 33
(TISTP/MFA) OTS price $1.25

National Aeronautics and Space Administration, Washington, D. C.
AN INVESTIGATION OF THE EFFECTS OF THE TIME LAG DUE TO LONG TRANSMISSION DISTANCES UPON REMOTE CONTROL. PHASE I. TRACKING EXPERIMENTS,
by James L. Adams. Dec 61, 50p. incl. illus.
(NASA Technical note D-1211)
(In cooperation with Stanford University under NASA Contract no. NSG 111-61.)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1211.

DESCRIPTORS: (*Time lag theory, *Control systems, *Remote control systems, Display systems.) (*Vehicles, Tracking, Helicopters, Feedback, Motor vehicle operators, Targets, Tests.) (Computers, Programming.)

A series of pursuit tracking tasks were performed incorporating a transport lag in the control loop. The target was a mixture of four sine waves, the fastest having a frequency of 16 cycles per minute at full speed. An attempt was made to design the experiments so they would provide data applicable to remote control of a ground vehicle over long transmission distances. Three programs were run. In each, the time lag was placed between the control and the display. In the first program a velocity control was used and the operator was told that his knob controlled a vehicle, the problem represented a road, and he was to drive his vehicle along the road, using the delayed vehicle position as feedback for whatever means he desired. The objective was not to match the display traces. In the second program a velocity control was used, and the operator was told that the problem trace represented a road and the delayed trace represented a vehicle and he was to keep them together. The objective was to match display traces. The third program was identical with the first, except that an acceleration control was used rather than a velocity control. (Author)

AD-268 146 Div. 8
(TISTE/NTM) OTS price $6.60

National Bureau of Standards, Boulder, Colo.
CHAPTER ON LONG WAVES FROM BOOK IONOSPHERIC PROPAGATION OF RADIO WAVES,
by Ya. L. Al'pert, tr. by Alex Nennsberg.
5 Aug 61, 61p. incl. illus. tables (NBS Trans. no. T5-60; from Academy of Science, USSR)
(ARPA Order no. 183) Unclassified report

DESCRIPTORS: (*Radio waves, Very low frequency, Propagation, *Ionospheric propagation, *Radio transmission, Wave transmission, Phase measurement, Velocity, Theory.) (Electromagnetic waves, Low frequency, *Atmospherics, Ionosphere, Waveguides.) (Translations, Technological intelligence, USSR.)

A physical theory of propagation of long waves was developed which provides methods of computation and makes it possible to compare theory with experiment. Also, new experimental results were obtained from 2 sources: direct experiments with radio waves, and indirectly by using atmospherics. Therefore, at present, it is not necessary to be limited to radio waves created by radio arrangements only, but it becomes possible to broaden the investigation down to electromagnetic waves at the lowest observed frequency (i.e., 10-12 kc). Some results of theoretical computations are presented, including super-low frequencies down to some tens of cycles per second. The results of experimental investigations of atmospherics, particularly the whistling atmospherics, are briefly analyzed. It should be noted that the question of electromagnetic waves, in the range 3-5 kc and lower, remains uninvestigated with adequate precision, either theoretically or experimentally up to the present time. (Author)

AD-268 169 Div. 8, 14
(TISTM/GEC) OTS price $3.60

Radio Corp., of America, Somerville, N. J.
PRODUCTION ENGINEERING MEASURE ON 300 WATT SILICON AUDIO TRANSISTOR.
Quarterly rept. 21 June-30 Sep 61,
by S. Silverstein and J. Wright. 30 Sep 61, 25p. incl. illus. tables.
(Contract DA 36-039-sc-85968)
Unclassified report

DESCRIPTORS: (*Transistors, Sound, *Silicon, Electrical properties, Resistance, Mechanical properties, Manufacturing methods, Processing, Diffusion, Seals, Metal films, Molybdenum, Brazing, Design, Packaging.) (Military requirements, Specifications, Industrial production.)

A triple-diffused, NPIN transistor was selected for fabrication as the specified 300 watt, audio transistor. Calculations were made of the collector breakdown voltage, current gain, thermal resistance, power gain, and power dissipation; with a few reservations, the present device geometry should satisfy the contract specifications. A new case, a double-ended stud package, was designed. In the mounting and sealing area, a Mo platform, 0.050 in. thick, between the pellet and the header will prevent warping problems in subsequent fabrication processes. Gold ribbon is now used to contact the mesa in place of gold wire because of its increased current-handling capabilities. (Author)

AD-268 180 Div. 8
(TISTE/NTM) OTS price $4.60

Stanford Research Inst., Menlo Park, Calif.
PATTERN MEASUREMENTS ON AN EXPERIMENTAL COMPOUND INTERFEROMETER ANTENNA,
by W. F. Gabriel. Oct 61, 39p. incl. illus. 4 refs. (Scientific rept. no. 1)
(Contract AF 19(604)8059)
(AFCRL-943) Unclassified report

DESCRIPTORS: (*Antenna radiation patterns, *Radar antennas, Helical antennas, Radio astronomy, Radio interferometers.) (*Antennas, Interferometers, Antenna horns, Broadband, Reflectors, High frequency, Ultra high frequency, Radio communication systems, Reliability.)

An experimental compound interferometer antenna of the pseudomonopulse type was constructed and tested to help evaluate its applicability as a possible radar antenna. The antenna consisted of 8 identical horn-reflector elements arranged

to provide a compound interferometer aperture measuring 160 wavelengths across. The half-power beamwidth measured about 12 minutes of angle at the operating frequency of 15 gigacycles. It was concluded that the natural adaptability of the compound interferometer to sidelobe suppression techniques would permit its use as a radar antenna in those applications where its high resolution and aperture conservation outweigh the disadvantage of a more complicated receiver. The antenna should be particularly attractive at HF and UHF bands, where aperture conservation is of quite some economic importance. Also, it should be useful for communications purposes as well as for radar. (Author)

AD-268 217 Div. 8
(TISTE/CRJ) OTS price $4.60

Brown U., Providence, R. I.
PROPAGATION ON MODULATED CORRUGATED RODS,
by C. C. Wang and E. T. Kornhauser. Aug 61, 22p. incl. illus. table, 9 refs.
(Scientific rept. no. AF 4561/12)
(Contract AF 19(604)4561)
(AFCRL-791) Unclassified report

DESCRIPTORS: (*Rods, Modulation, Surface properties, *Wave transmission, Mathematical analysis.) (*Antennas, *Electromagnetic waves, Propagation, Differential equations.)

The velocity of surface-wave propagation on 2 types of axially modulated corrugated rods was measured experimentally. Type A has a constant outer diameter and sinusoidally varying slot depth, while in type B the slot depth varies in virtue of a modulated outer diameter. In both cases the measured phase velocity was about 10% less than that for a uniformly corrugated rod with the average slot depth and outer diameter, but agreed within 2% over the frequency range used with the value calculated from an analysis based on the Mathieu equation. (Author)

AD-268 229 Div. 8
(TISTE/CDM) OTS price $3.60

Electrical Engineering Research Lab., U. of Illinois, Urbana.
INVESTIGATION OF MICROWAVE DUPLEXER SWITCHING MECHANISMS.
Quarterly progress rept. no. 10, 1 July-30 Sep 61,
by M. Roux. 15 Oct 61, 29p. incl. illus. tables, 4 refs.
(Contract DA 36-039-sc-78313)
Unclassified report

DESCRIPTORS: (*Microwave equipment, *Radar duplexers, *Switching circuits.) (*Gas ionization, Radiofrequency pulses, Shock waves, Sound, Microwaves, X band, Propagation.) (*Plasma physics, Test equipment, Tests, Mathematical analysis.)

Investigations intended to determine the character of waves propagating in the plasma, formed in a tube by a high power RF pulse, were continued using a mixture of gases exhibiting the charge exchange effect. Experimental results indicate the presence of sound waves in the neutral gas as well as pseudo sound waves in the gas of the ions. The plasma, created by the high power RF pulse, extends in the tube far from the region where this pulse is applied, as a result of the energy leaking from this region. Theoretical considerations and experimental evidence indicate this energy progresses along the tube by a surface mode of propagation. The validity of detection of discontinuities by means of the light intensity was verified by a microwave method. Presence of discontinuities is evidenced by an enhanced attenuation in the transmitted microwave signal. Problems associated with the limitation in the range of detection by microwaves are discussed. (Author)

AD-268 256 Div. 8
(TISTE/CDM) OTS price $8.10

Merrimac Research and Development, Inc., Irvington, N. J.
EXTREMELY BROAD BAND FERRITE DEVICES.
Final rept.,
by David S. Friedman and Jerome Rosen. 5 Sep 61, 79p. incl. illus. (Rept. no. E-41-5)
(Contract AF 19(604)7288)
(AFCRL-779) Unclassified report

DESCRIPTORS: (Broadband, *Coaxial cables, *Coupling circuits, *Ferrites, Design.) (Transmission lines, Conductors, Electromagnetic shielding, Tests.) (Conductors, Coupling circuits, Ferromagnetic materials, Magneto-optic rotation, Theory, Mathematical analysis.)

An investigation was made of a shielded twin inner conductor transmission line as the vehicle for obtaining extremely broad bandwidth nonreciprocal coaxial components. The inner conductors were coupled through a coextensive magnetized ferrite rod and a process completely analogous to Faraday rotation transferred energy between the conductors. The rotational process was essentially flat for frequencies of twice the magnetization and higher. The TEM transmission structure offered no dispersion but limited the highest frequencies. The principles of gyromagnetic coupling are analyzed and a formulation determined which covers the simultaneous effects of reciprocal and nonreciprocal coupling. Means are discussed to eliminate reciprocal coupling as well as backward wave coupling. Experimental results confirmed the large bandwidth produced with nonreciprocal coupling where flat coupling was observed between 1.8 and 5.6 kmc. (Author)

AD-268 263 Div. 8
(TISTE/NTM) OTS price $8.90

Pickard and Burns, Inc., Needham, Mass.
NON-LINEAR TECHNIQUES IN ANTENNA THEORY.
Final rept.,
by Hans E. Band. Sep 61, 95p. incl. illus. 18 refs. (P & B Pub. no. 720)
(Contract AF 19(604)7275; Continuation of Contract AF 19(604)4535)
(AFCRL-780) Unclassified report

DESCRIPTORS: (*Antennas, Correlation techniques, Theory, Interferometers, Nonlinear systems, Electronic equipment.) (Audiofrequency, Modulation, S band.) (*Radar signals, Data processing systems, *Radio signals, Radio receivers, Electromagnetic waves, Signal-to-noise ratio, Antenna radiation patterns, Polynomials.)

Efforts were made to prove that certain nonlinear operations performed on the signals de-

rived from various simple receiving antenna elements have the effect of producing effective antenna patterns equivalent to those derived from ordinary (linearly-processed or at most square-law detected) receiving antenna systems, whose aperture length and element number exceeds that of our antenna proper by a significant ratio. The polynomial experiment provided the most striking (if imperfect) verification of this proposition. Many experiments have suggested themselves and some are described. (Author)

AD-268 270 Div. 8, 5
(TISTE/CDM) OTS price $9.60

Raytheon Co., Waltham, Mass.
STUDIES IN IONOSPHERIC PROPAGATION.
Final rept. 1 Feb 60-31 May 61,
by Harry Hoogasian. 30 June 61, 116p. incl. illus. tables.
(Contract AF 19(604)5230)
(AFCRL-923) Unclassified report

DESCRIPTORS: (*Ionospheric propagation, *Radio waves, High frequency, *Radio transmission, *Wave transmission, Scattering, *Radio signals, Measurement.) (Design, Data processing systems, Recording paper, *Recording devices, Digital computers.) (*Ionosphere, Tests, Radio interferometers, Antennas.) (*Radio communication systems, Radio reception, Tests.)

A study was made of several problems arising from the transmission of HF radio waves through the ionosphere. The primary objective was to design and perform conventional pulse propagation experiments to study transmission characteristics. Specific areas covered were: a spectrum analysis of backscatter and one-way transmissions, with special attention to the phase stability of the signals under normal and disturbed conditions; investigation of properties of signals circulating around the world; and an investigation of sporadic E backscatter, employing a radio interferometer and a rotating antenna. A punched paper tape system intended to record propagation data in a form adaptable to processing by digital computers was also developed. To isolate a wanted signal characteristic for closer study, some experiments made use of processing techniques which are somewhat novel to HF experiments. Notable examples of this were the use of coherent detection for the signal phase studies and the operation of a radio interferometer during the sporadic E studies. Since coherent detection was basic to the spectrum analysis studies, the problem of instrumenting this technique was taken up in detail. (Author)

AD-268 285 Div. 8, 12
(TISTE/CDM) OTS price $1.60

Watkins-Johnson Co., Palo Alto, Calif.
DEVELOPMENT OF TRAVELING-WAVE TUBE AMPLIFIER FOR SPACE COMMUNICATION SATELLITES.
Technical rept. no. 1, 1 July-30 Sep 61,
by Lester A. Roberts. 12 Oct 61, 15p. incl. illus. tables.
(Contract DA 36-039-sc-87480)
Unclassified report

DESCRIPTORS: (*Traveling wave tubes, *Microwave amplifiers, Airborne, *Communication equipment, *Satellite vehicles.) (Electron tubes, Helixes, Electron guns, Beryllium compounds, Oxides, Waveguide couplers, Design.)

Research was begun on a 35 watt, long-life, reliable traveling-wave tube amplifier for use in space communications satellites. Work accomplished on the mechanical details of the circuit, the matching sections, collector, and electron gun are described. Construction details of the first beam testing structure are given. (Author)

AD-268 286 Div. 8
(TISTP/GW) OTS price $10.10

Westinghouse Electric Corp., Pittsburgh, Pa.
HEAT DIODE CONVERTER.
Interim scientific rept. no. 2, 1 Aug-31 Oct 61, 20 Nov 61, 100p. illus. 11 refs.
(Contract AF 33(616)8262)
Unclassified report

DESCRIPTORS: (*Thermoelectricity, Electric power production, Space flight.) (*Thermionic emission, *Diodes, Magnetic fields.) (*Cathodes, Construction, Electron beams, Electron bombardment.) (*Thermionic emission, *Electric power plants, Life expectancy.)

Contents:
Thermionic diode currents in transverse magnetic fields
Fabrication of electron beam heated button-cathode cell
The lifetime and efficiency of a thermionic energy converter
The calculation of the efficiency of energy conversion by thermionic emission

AD-268 306 Div. 8
(TISTE/NTM) OTS price $9.60

Centre de Physique, Electronique et Corpusculaire (France).
ONE WATT O-TYPE CARCINOTRON FOR OPERATION AT 150 KMc/s.
Final rept.
July 61, 1v. incl. illus. 8 refs. (Rept. no. WR 739)
(Contract AF 61(052)410)
(RADC TDR 61-270) Unclassified report

DESCRIPTORS: (*Backward-wave oscillators, Microwave oscillators, Design, France, Tests.) (*Electron tubes, *Electron guns, Microwave equipment, Cathodes (Electron tubes), Waveguide windows, Capillary tubes.) (Test equipment, Interferometers, Wattmeters.)

Tubes were designed which deliver an output power larger than one watt, in CW operation at a wavelength of 2 mm with a tuning range larger than 5% (7500 mc). The tubes were operated in electromagnets and under such conditions that good life is expected. The efficiency of the tubes, while low, is comparable to the efficiency achieved in the first 4 mm tubes designed. Significant progress was made in machining accuracy, in vacuum processing and in general technology. Important progress was made in gun designs for very high current density and in large power density handling problems. (Author)

AD-268 307 Div. 8
(TISTE/NTM) OTS price $4.60

Centre de Physique, Electronique et Corpusculaire (France).
RESEARCH ON 8 MILLIMETER M-TYPE CARCINOTRON TUBES.
Status rept. no. 5.
July 61, 1v. incl. illus. (Rept. no. WR 726)
(Contract AF 61(052)413)
(RADC TDR 61-296) Unclassified report

DESCRIPTORS: (*Backward-wave oscillators, Microwave oscillators, Design, Tests, France.) (Electron tubes, Microwave equipment, Cathodes (Electron tubes), Anodes (Electron tubes), Electrodes, Waveguide windows, Magnetic fields, Machining, Standing wave ratios, Measurement.)

Improvements were obtained concerning circuit machining, vacuum, hobbing of interdigital lines, sole centering device, cathode and magnets. The results on circular tubes No. 4 and 5 confirmed the results obtained on tubes 1, 2, and 3. The main advances over the CM 08 were in the range of frequencies and the reproducibility of the results. The better CM 08's delivered more than 15 or 20 watts and their circuits were mediocre. Electrically, the main differences between the 2 types are circuit dimensions, operating magnetic field (determined by trial), presence of the wide anode block in the CM 07, and barrel-shaped magnetic field in the CM 07. (Author)

AD-268 326 Div. 8, 2, 5, 13
(TISTE/NTM) OTS price $2.60

Instrumentation Lab., Mass. Inst. of Tech., Cambridge.
DESIGN PRINCIPLES FOR AN ACCURATE LARGE-APERTURE TRACKING ANTENNA,
by P. N. Bowditch and E. J. Frey. Feb 61, 24p. incl. illus. (Rept. no. R-326)
(Contract AF 04(647)303)
Unclassified report

DESCRIPTORS: (*Parabolic antennas, Radio astronomy, Communication systems, Tracking, Design, Structures.) (Reflectors, Antennas, Radio equipment, *Antenna masts, Antenna hardware, Load distribution, Physical properties.)

The combination of techniques, some of which are novel, appear to make possible the building of fully steerable antennas of large size which achieve high resolution and accurate performance at a lower cost. Also, these antennas can be made to track through the zenith with only 2 axes of rotation. The study presented here is preliminary in nature and describes principles rather than presenting detailed engineering solutions. (Author)

AD-268 327 Div. 8, 13
(TISTE/NTM) OTS price $3.60

Instrumentation Lab., Mass. Inst. of Tech., Cambridge.
DESIGN OF A DISH ANTENNA FOR PRESCRIBED DEFORMATIONS,
by John M. Dahlen. Nov 60, 34p. incl. illus. tables (Rept. no. E-968)
(Contract AF 04(647)303)
Unclassified report

DESCRIPTORS: (*Parabolic antennas, Antenna hardware, *Antenna masts, Reflectors, Design, Beams, Configuration, Deformation, Structures, Analytic geometry, Mathematical analysis, Synthesis, Load distribution, Stresses.)

A method is developed for sizing the structural truss members of a dish antenna to assure retention of paraboloidal form and constant focal length during external loading. This method can be modified to suit other structural forms and deformation requirements. Since this method is most easily applied to statically determinate structures, a short discussion on the synthesis of rigid, firmly anchored, statically determinate trusses is given. (Author)

AD-268 328 Div. 8
(TISTE/NTM) OTS price $8.10

Ionosphere Research Lab., Pennsylvania State U., University Park.
PHASE DISTORTION IN HIGH FREQUENCY TRANSISTOR AMPLIFIERS,
by T. A. Seliga. 1 Dec 61, 77p. incl. illus. 31 refs. (Scientific rept. no. 153)
(NASA Grant no. NsG-134-61)
Unclassified report

DESCRIPTORS: (*Phase distortion, High frequency, *Transistor amplifiers, *Tuned amplifiers, Measurement.) (Amplifiers, Transistors, Phase shifters, Radio receivers, Radar receivers, Phase measurement, Phase modulation, Impedance, Mathematical analysis.)

An analysis of phase distortions occurring in high frequency transistor amplifiers resulting from the application of automatic gain control is presented. The analysis is based on the expression for the current gain of the amplifier. Verification of the theory is made by comparing calculated and measured phase shifts in single amplifiers and a receiving system. The problems of choosing the most suitable type of automatic gain control system, and transistor, based on a minimum phase distortion criteria are also considered. (Author)

AD-268 338 Div. 8
(TISTE/CRJ) OTS price $5.60

Nuclear Corp. of America, Denville, N. J.
HIGH POWER PULSE SWITCH TUBE,
by B. Bernstein, J. Glauber, and H. Koch.
16 Aug 61, 25p. illus.
(Contract AF 30(602)2027)
(RADC TR 61-116) Unclassified report

DESCRIPTORS: (*Tetrodes, *Switching circuits, Electronic switches, Electrodes, Design.) (Electron tubes, Switches, Circuits, Electron tubes heaters, *Cathodes (Electron tubes), Oxide cathodes, Materials, Tungsten.) (Gases, Absorption, Reduction.)

The design of a 45 megawatt tetrode switch tube with water cooled grids, water cooled anode and matrix cathode is described. The choice of the matrix type cathode was made after consideration was given to all other popular types. Preliminary experiments which led to the final assembly method are described. The calculation of the tube characteristics is explained in detail. Drawings and sketches of the various parts, subassemblies and assemblies are included. A simplified proposed design is mentioned. (Author)

AD-268 389 Div. 8
(TISTW/DLW) OTS price $8.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
AN ANALYSIS OF ANTENNAS CONFRONTED BY OBSTACLES.
Rept. on Study of Electromagnetic Window Dielectric Techniques,
by Thomas E. Charlton. 30 Nov 61, 85p. incl. illus. 35 refs. (Rept. no. 1180-8)
(Contract AF 33(616)7614)
Unclassified report

DESCRIPTORS: (*Antennas, *Antenna radiation patterns, Electromagnetic waves, Electromagnetic fields, Scattering, Electromagnetic wave reflections, Wave transmission, Mathematical analysis, Partial differential equations, Integrals, Numerical analysis.) (Electromagnetic waves, Cylindrical bodies, Dielectrics, Scattering, Computer logic.)

The principle of reciprocity is employed to formulate integral expressions for the fields of antennas confronted by obstacles. The expressions formulated are particularly useful in applying a high-speed computer to the calculation of antenna-obstacle interaction. The integrals encountered require surface integrations over the antenna aperture or on a surface enclosing the obstacle. The problem of computing the far-field pattern of an antenna-obstacle system is treated in detail. A number of approximate methods for finding the plane-wave scattered fields and the fields on the obstacles is discussed. The validity of the expressions formulated is checked by a comparison of experiment and calculation. Complex obstacle configurations, a cylinder and dielectric sheet combination, and finally a pair of parallel cylinders are treated successfully by approximate methods. (Author)

AD-268 394 Div. 8
(TISTE/CDM) OTS price $5.60

Electronic Defense Labs., Mountain View, Calif.
A VOLTAGE TUNABLE OSCILLATOR IN L-BAND,
by Robert D. Hall. 1 Aug 61, 46p. incl. illus. 3 refs. (Technical memo. no. EDL-M354)
(Contract DA 36-039-sc-87475)
Unclassified report

DESCRIPTORS: (*Microwave oscillators, *Triodes, L band, *Tuning circuits, Design, *Ferroelectric materials.) (Electron tube oscillators, Variable capacitors, *Tuning devices, Ferroelectric crystals.) (Electron tubes, Oscillators.)

Development of a voltage-tunable planar-triode oscillator in the 500 to 1000 mc range was undertaken to assess the capabilities of ferroelectric materials as tuning elements. The frequency range was chosen in response to a general requirement for L-band voltage-tunable oscillators and to demonstrate the ability of ferroelectrics to operate at frequencies beyond the useful range of available diode tuning capacitors. A 500-mc oscillator was constructed using a planar triode tube. The oscillator could be tuned electrically over a 15 per cent bandwidth. The tuning was accomplished by a solid element with low-power drain and no moving parts. A discussion of the tuning element, tuning technique, circuit design, limitations and some possible improvements is included. (Author)

AD-268 398 Div. 8
(TISTE/CDM) OTS price $7.60

General Electric Co., Auburn, N. Y.
INVESTIGATIONS OF ELECTRONICALLY CONTROLLABLE TURN-OFF CONTROLLED RECTIFIERS.
Quarterly progress rept. no. 4 (Final) 30 June 60-30 June 61,
by J. Moyson and J. Petruzella. 30 June 61, 75p. incl. illus. 5 refs.
(Contract DA 36-039-sc-85062, Proj 3A99-21-001)
Unclassified report

DESCRIPTORS: (*Rectifiers, Silicon, Manufacturing methods, Design.) (*Transistors, Electronic equipment, Control, Switching circuits, Measurement.)

Efforts were devoted toward the realization of a high gain gate turn-off controlled rectifier. Basically, 2 types of turn-off structures evolved: (1) the modified PNPN and (2) the composite PNPN-NPN. A maximum turn-off gain of 75 was achieved using the modified PNPN structure whereas turn-off gains up to 500 were observed on the composite PNPN-NPN structure. Details of both structures are discussed including theory of operation, fabrication techniques, experimental data and results, measurements and test equipment. Finally, over-all conclusions and recommendations are presented. (Author)

AD-268 416 Div. 8, 14, 26
(TISTE/NTM) OTS price $1.60

Chatham Electronics Div., Tung-Sol Electric, Inc., Livingston, N. J.
PRODUCTION ENGINEERING MEASURE FOR POLYOPTIC SEALING OF HYDROGEN THYRATRON TUBES.
Quarterly progress rept. no. 9, 1 July-30 Sep 61,
by Ward W. Watrous. 27 Oct 61, 14p. incl. illus.
(Contract DA 36-039-sc-81289)
Unclassified report

DESCRIPTORS: (*Thyratrons, *Glass seals, Hydrogen, Sealing compounds, Production, *Manufacturing methods.) (*Miniature electron tubes, Electron tubes, Seals, Enamel coatings, Electrical properties, Mechanical properties, Temperature, Life expectancy, Tests.)

Research was continued on the polyoptic sealing of hydrogen thyratron tubes. Life tests were continued. All tubes required to have been made on the automatic exhaust machine have either completed life test or are being tested. The present results show no essential difference in survival rates between the 2 types of seals. No further work on variations in sealing techniques was done but consideration is given to an extension of the high temperature bake process investigation. Initial work was begun in determining the proper techniques for polyoptic sealing on trolley exhaust. (Author)

AD-268 422 Div. 8, 25
(TISTE/CDM) OTS price $2.60

David Sarnoff Research Center, Princeton, N. J.
RESEARCH IN ELECTRON EMISSION FROM SEMICONDUCTORS.
Quarterly rept. no. 4, 1 July-30 Sep 61,
by R. E. Simon, E. K. Gatchell and others.

30 Sep 61, 25p. incl. illus. (Rept. no. 12)
(Contract DA 36-039-sc-87388)
Unclassified report

DESCRIPTORS: (*Semiconductors, *Thermionic emission, *Photoemission, Field emission, Measurement.) (Silicon, Cesium, Materials, Impurities, Surface properties, Electrons, Scattering, Analysis.) (Crystals, Electrodeposition, Heat treatment, Surfaces, Processing.)

Efforts were directed toward developing a large area front surface hot electron emitter of silicon. This work included the study of cesium-silicon contacts, the diffusion of thin n-layers into silicon and the stripping of portions of the thin diffused n-type layer, and an attempt to observe hot electron emission from an emitter made by diffusion. In addition, an attempt was made to observe electron emission from cesium treated silicon by applying high voltage pulses across a crystal containing no junction. Theoretical calculations of the rate of energy loss of hot electrons in a metal are also reported. (Author)

AD-268 424 Div. 8, 5
(TISTP/WH) OTS price $2.60

New Mexico U. Engineering Experiment Station, Albuquerque.
TRANSMISSION COEFFICIENTS FOR ELECTROMAGNETIC PLANE WAVE RADIATION INTO A CONDUCTING HALF-SPACE,
by Elizabeth B. Simmons. 1961. 19p. incl. illus. 2 refs. (Technical rept. no. EE-60)
(Contract Nonr-279801)
Unclassified report

DESCRIPTORS: (*Wave transmission, Air to underwater, *Sea water.) (Electromagnetic waves, Radiofrequency, Propagation.) Underwater radio transmission.

The transmission of uniform plane waves from the air into a highly conductive medium such as sea-water is treated. Exact and approximate equations describing the transverse electric and transverse magnetic cases are derived and results interpreted. Graphs of the transmission coefficients versus the angle of incidence at specific frequencies are included. (Author)

AD-268 433 Div. 8, 2
(TISTE/CDM) OTS price $4.60

Ionosphaeren-Institut Breisach (Germany).
IONOSPHERIC PULSE TRANSMISSION OVER LARGE DISTANCES: IDENTIFICATION OF TRACES.
Annual summary rept. 1959-1960,
by Rudolf Eyfrig and Karl Rawer. 30 Nov 60, 23p. illus. tables, 11 refs.
(Contract AF 61(052)129)
(AFCRL-537) Unclassified report

DESCRIPTORS: (*Ionospheric propagation, *Pulse transmitters, Radio signals, Identification, Angle of arrival, Frequency, Measurement.) (Ionosphere, *Radio transmission, Wave transmission, *Radio waves, Analysis.) Communication systems.

Research was continued on ionospheric pulse transmission over large distances. Identification of the traces from amplitude records alone is difficult, so that the rules for identification from delay time records are important. Principles for identification of traces in oblique incidence pulse records, rules for application, and detailed examples are given.

AD-268 446 Div. 8, 26
(TISTE/NTM) OTS price $3.60

Litton Electron Tube Corp., San Carlos, Calif.
ENGINEERING AND PRODUCTIZATION OF AN INTEGRATED FAMILY OF BACKWARD WAVE OSCILLATORS.
Interim technical engineering rept. 7 July-7 Oct 61,
by James E. Orr. Nov 61, 20p. incl. illus.
(Contract AF 33(600)43396)
(AMC TR 7-652(I)) Unclassified report

DESCRIPTORS: (*Backward-wave oscillators, Broadband, Electron tubes, Production, Manufacturing methods.) (*Electron tube oscillators, *Oscillators, Tuned circuits, Electron optics, Life expectancy, Tests, Temperature.)

A family of electronically tuned, broad band oscillator tubes were developed that are physically and electrically similar from band to band. These tubes are being production engineered and productized for system application. Redesign of the tubes in bands 1, 6 and 8 was completed. Sub-assemblies were undergoing extensive life test to evaluate the designs. Life test consoles were designed and fabrication was started. Thermal drift compensation for these bands was started and the electron optics was checked by calculating electron trajectories. Material improvement and tooling improvement programs were initiated. (Author)

AD-268 453 Div. 8, 6, 12
(TISTW/DLW) OTS price $2.60

National Aeronautics and Space Administration, Washington, D. C.
PROJECT ECHO - 961-Mc LOWER-SIDEBAND UP-CONVERTER FOR SATELLITE-TRACKING RADAR,
by M. Uenohara and H. Seidel. Dec 61, 25p. incl. illus. tables, 4 refs. (NASA Technical note no. D-1136)
(In cooperation with Bell Telephone Labs., Whippany, N. J., Contract NASw-110)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note no. D-1136.

DESCRIPTORS: (*Parametric amplifiers, Microwave amplifiers, Preamplifiers, Sidebands, *Radar tracking, Radar receivers, L band, Satellite vehicles, Tracking, Noise (Radar), Reduction, Design.) (Radar equipment, Amplifiers, Stability, Impedance, Tests.)

A 961 mc lower-sideband up-converter was specially designed to serve as preamplifier for the satellite-tracking radar in project Echo. The amplifier and its power supply are separately boxed and are installed directly behind the tracking antenna. The amplifier functions most satisfactorily and is used to track the Echo satellite from horizon to horizon. The special steps are described which were taken to ensure that the amplifier met the particular system

needs of low noise, absolute stability, insensitivity to temperature fluctuations, and high input-power level before the onset of gain compression. The satisfactory operation of the amplifier confirmed the great potentiality of parametric amplifiers as stable, low-noise, high-frequency receivers. (Author)

AD-268 460 Div. 8, 25
(TISTP/MFA) OTS price $3.60

Microwave Lab., Stanford U., Calif.
PULSED MAGNETIC-FIELD MILLIMETER WAVE GENERATOR.
Quarterly progress rept. no. 7, 1 June-31 Aug 61, on the Study of the Feasibility of a Solid-State, Two-Level, High-Power Microwave Generator.
Sep 61, 30p. incl. illus. table (ML rept. no. 856)
(Contract DA 36-039-sc-85263, Proj. 3-99-00-000)
Unclassified report

DESCRIPTORS: (*Pulse generators, Microwave amplifiers, Microwaves, Extremely high frequency, Low pass filters, K band, Feasibility studies, *Solid state physics.) (Waveguides, Ferrites, Dielectrics, Single crystals, Garnet.) (*Ferromagnetic materials, Electrical properties, Spin.) (Experimental data, Research program administration.)

Further experiments on pulsed microwave generation without an rf input signal gave positive results marking the first reported successful results with this mode of operation. Various operating characteristics were measured, samples of which are shown. These characteristics are being analyzed. Measurements of resonance properties of single crystal and polycrystalline garnet samples in the form of thin disks were continued with interesting results. Serious line broadening was found to exist in single crystal disks when the direction of the dc field makes a small angle to a principal axis of the sample. Progress was made on theoretical analysis of the spin wave suppression scheme (harmonic suppression) whose basic principles were described (AD-263 610). It was found that some of the required conditions can be met through use of YIG crystals having planar crystal symmetry and a high crystalline anisotropy field. (Author)

AD-268 503 Div. 8, 2
(TISTW/DLW) OTS price $11.00

Stanford Electronics Labs., Stanford U., Calif.
A STUDY OF RADIO-ASTRONOMY RECEIVERS,
by R. S. Colvin. 31 Oct 61, 136p. incl. illus. tables, 29 refs. (Scientific rept. no. 18; Stanford Radio Astronomy Institute Publication no. 18A)
(Contract AF 18(603)53)
(AFOSR-1603) Unclassified report

DESCRIPTORS: (*Radio astronomy, *Radio receivers, Radiometers, Antennas, Signal-to-noise ratio, Radiofrequency filters, Modulation, Automatic volume control, Correlation techniques, Radio equipment, Stability, Effectiveness.) (Radio signals, Extraterrestrial radio waves, Detection.) Microwaves, Signaling mirrors, Analysis, Radio receivers.

A study was made of radio-astronomy receivers to furnish a consistent basis for predicting and comparing the performance of different systems. This basis is provided by clearly defining the important factors and by analyzing a variety of receivers and comparing their performance with a total-power receiver. The concepts developed are used to analyze and evaluate the performance of the Stanford microwave spectroheliograph receiver, which is described in detail, and to establish the relationship of the instrument to its antenna and its observational requirements. (Author)

AD-268 507 Div. 8, 14
(TISTM/TCG) OTS price $3.60

Sperry Gyroscope Co., Great Neck, N. Y.
HIGH AVERAGE POWER R-F-WINDOW STUDY.
Quarterly memo. no. 3, 26 July-26 Oct 61, by D. B. Churchill and E. W. Cheatham. Nov 61, 16p. incl. illus. (Rept. no. NA-8220-8261-3)
(Contract AF 30(602)2428)
Unclassified report

DESCRIPTORS: (*Waveguide windows, Dielectrics, Ceramic materials, Single crystals, Synthetic gems, Sapphires, Aluminum compounds, Beryllium compounds, Oxides, Wave transmission, Electron bombardment, Seals, Design, Tests.) (Cavity resonators, Waveguide couplers, Design.) Microwave equipment, Broadband, Electron tubes, Waveguides.

The arc-detector and protective circuit was modified to achieve a faster response time and positive operation in the event of a waveguide arc; a special test system was developed to measure the response time. A system of automatic attenuation was developed to reduce the high-power drive signal in the presence of a severe load mismatch. A heterodyne arrangement was devised to permit the low-power c-w oscillator signal to be used as a fixed-frequency marker on the swept-frequency response pattern of the ring resonator. The first test window structure was tested at high levels of c-w power in the ring resonator. The structure consisted of a compression-sealed disc of sintered BeO ceramic in a cylindrical waveguide joined by conical mode transducers. The window transmitted 75 kw of power without evidence of breakdown or change of electrical characteristics. Internal arcing occurred in the ring resonator at the 75 kw level. A compression sealed double-disc window structure using thin sapphire discs was developed and cold tested. Some modifications were made to the BeO-disc water load to improve its bandwidth, and to increase the rate of water flow. (Author)

AD-268 517 Div. 8
(TISTW/DLW) OTS price $1.60

Watkins-Johnson Co., Palo Alto, Calif.
APPLIED RESEARCH ON A HIGH-POWER MILLIMETER-WAVE GENERATOR.
Interim engineering rept. no. 2, 1 Sep-30 Nov 61, by James W. Sedin. 13 Dec 61, 15p. incl. illus.
(Contract AF 33(616)8369)
Unclassified report

DESCRIPTORS: (*Backward-wave oscillators, *Radiofrequency generators, Microwave oscillators, *Microwaves, Radiofrequency power, Extremely high frequency, Waveguides, Waveguide

windows, Design, Feasibility studies.) (Electron tubes, Beam power tubes, Test equipment, Standing wave ratios, Wave transmission, Tests.)

Investigations were continued to demonstrate the feasibility of developing a backward-wave oscillator capable of generating 100 kw peak power and 1000 watts average power at 100 gc. A beam tester was completed and tested at voltages to 35 kv. Beam transmission of 95.5% was achieved through a 70 mil diameter drift tube 1 in. long by using auxiliary magnets to cancel leakage magnetic field in the region of the cathode. A new anode with an internal flux shield was designed to reduce the stray fields in the cathode region to an acceptable value. A thin mica window was successfully sealed by compression between two copper washers. A silicon carbide waveguide termination 0.77 in. long was developed with a reflection coefficient under 30% from 70-85 gc. (Author)

AD-268 579 Div. 8, 5
(TISTW/DLW) OTS price $18.50

Continental Electronics Mfg. Co., Dallas, Tex.
RADIO TRANSMITTING SET AN/FRT-33 (XC-1).
Final technical rept., May 54-June 58,
by W. D. Mitchell. June 58, 221p. incl. illus.
(Contract DA 36-039-sc-64441, DA Proj. 3-24-01-071)
Unclassified report

DESCRIPTORS: (*Radio communication systems, *Power amplifiers, *Radio transmitters, Radio-frequency amplifiers, High frequency, Sidebands, Broadband, Transmission lines, Power supplies, Cooling, Electronic circuits, Radio equipment, Design.)

The technical aspects are presented of the development of radio transmitting set AN/FRT-33 (XC-1). The equipment is an amplifier capable of long range communications, rated at a nominal cw output of 300-kw average power and a minimum of 300-kw peak power for single-sideband communications systems. The radio transmitting set AN/FRT-22, excited by radio transmitting set T-409/FRC-30, was modified to extend the operating frequency range to 4 to 30 mc, without a gap, and to have a 1% overlap at the ends of the range. It was used as a driver for the 300-kw amplifier. (Author)

AD-268 617 Div. 8
(TISTE/NTM) OTS price $2.60

Microwave Associates, Inc., Burlington, Mass.
PHASE SHIFTER STUDY PROGRAM (NON-FERRITE).
Quarterly progress rept. no. 5, 1 July-30 Sep 61,
by Kenneth E. Mortenson. Nov 61, 21p. illus.
(Contract NObsr-81470)
Unclassified report

DESCRIPTORS: (*Phase shifters, *Semiconductors, Microwave equipment, L band, Electronic circuits, Electronic scanners, Diodes, Waveguide couplers, Coaxial cables, Design.)

Research was continued on non-ferrite phase shifters. Two general phase-shifting techniques were investigated, both of which employ semiconductor elements. The first approach is the step or incremental phase-shifting device which provides for discrete changes in phase. The second phase-shifting approach is a continuously variable one which provides for a greater flexibility in phase control. Both the semiconductor material and the circuit problems involved in each of these two approaches were further explored in some detail. The present study indicate that both the desired phase-shifting characteristics as well as power-handling capabilities can be reached. Phase shifters were built for L-band which, for the incremental type, can handle peak powers in excess of 50 Kw, and for the continuous type can handle 2 Kw peak power. (Author)

AD-268 645 Div. 8
(TISTE/CDM) OTS price $1.60

RCA Defense Electronic Products, Camden, N. J.
PARAMETRIC AMPLIFIER STUDY.
Final rept. on Task 1A.
by J. Twinam, G. Wild and K. Morris. 6 Oct 61,
11p. illus. 4 refs.
(Contract DA 36-039-sc-87240)
Unclassified report

DESCRIPTORS: (*Parametric amplifiers for *Radio receivers, Frequency converters, Theory, Design.) (Amplifiers, High frequency, Diodes, Electronic circuits, Crystal filters, Test methods, Tests, Measurement, Radio interference, Noise (Radio).)

A study was made on parametric amplifiers and their receiver applications. The low noise properties of parametric amplifiers make them especially attractive in applications where very small signals are present. An outline is presented of important parameters which must be considered in the design of parametric amplifiers for applications where signals are present, and data taken during a series of tests conducted on experimental models of both up-converter and down-converter parametric amplifiers are given. (Author)

AD-268 657 Div. 8
(TISTW/DLW) OTS price $1.60

Bomac Labs., Inc., Beverly, Mass.
BL-223A C-BAND MAGNETRON.
Quarterly progress rept. no. 4 on Step 2,
19 July-19 Oct 61,
by Kenneth A. Todd, Jr., Leonard Safran, and Richard S. Briggs. 19 Oct 61, 17p. incl. illus.
(Contract DA 36-039-sc-85946)
Unclassified report

DESCRIPTORS: (*Magnetrons, C band, Microwave amplifiers, Power amplifiers, Design, Processing, Manufacturing methods.) Electron tubes.

The 400 watt type cathode assembly was modified to the 1000 watt type assembly in increasing the oxide dispenser cathode length 0.025 in. The height of the anode was increased 0.25 in. and the anode bore-out or interation space was increased 0.004 in. in diameter. The cathode pole piece was shortened 0.025 in. and moved back from the anode by the same amount to maintain the same anode to pole piece spacing. Increasing the tube power output from 400 watts to 1000 watts necessitated in increasing magnetic flux density. The tube shield was redesigned from a round type to a square type. The tube weight was increased from 6 to 8 ounces. Tests show that the preliminary sample tubes conform to the electrical and thermal specifications. (Author)

AD-268 664 Div. 8, 26
(TISTE/NTM) OTS price $2.60

General Electric Co., Syracuse, N. Y.
PRODUCTION ENGINEERING MEASURE ON HIGH PERVEANCE CATHODE RAY TUBES.
Quarterly progress rept. no. 1, 8 June-8 Sep 61, by Edward T. Rate. 8 Sep 61, 26p. illus.
(Contract DA 36-039-sc-85965)
Unclassified report

DESCRIPTORS: (*Cathode ray tubes, Production, Design.) (Electron tubes, Cathodes (Electron tubes), Electron guns, Anodes (Electron tubes), Electrodes, Modulation, Electron optics, Collimators, *Manufacturing methods.)

Efforts are being made to establish cathode ray tube designs suitable for quantity production and to establish a limited manufacturing facility capable of producing 200 gross focus reflex modulation tubes per month on a single shift basis. Initial designs are presented for the Z-4809 focus reflex modulation cathode ray tube. Component parts were assembled, necessary laboratory tooling accomplished and experimental tubes were constructed. (Author)

AD-268 667 Div. 8
(TISTE/CDM) OTS price $6.60

Electronics Research Lab., U. of Calif., Berkeley.
A CIRCUIT MODEL FOR A SILICON MESA TRANSISTOR,
by H. T. Chua. 31 July 61, 65p. incl. illus. 21 refs. (Series no. 60, Issue no. 386)
(Contract AF 49(638)1043)
Unclassified report

DESCRIPTORS: (*Transistors, Silicon, Tests, Measurement, Mathematical analysis.) (*Video amplifiers, Electronic circuits.)

A study is presented on the behavior of the mesa transistor as the active component in a video amplifier. The drift potential across the base was found; and the internal parameters of the transistor based on the one dimensional analysis were obtained by solving the continuity equation. Simple calculations of the parameters were made and used, together with the knowledge of the physical dimensions, to develop the equivalent circuit. The method of measurements of the parameters is discussed, then follow the actual measurements, which are compared, wherever possible, with the calculated values. The equivalent circuit and the measured parameters were finally used in a simple video amplifier circuit. From the calculated and measured response of the amplifier, the equivalent circuit of the mesa transistor was simplified and found to be similar to that of a normal transistor. (Author)

AD-268 678 Div. 8
(TISTP/MFA) OTS price $16.00

Electron Physics Lab., U. of Michigan, Ann Arbor.
PHASE FOCUSING IN LINEAR-BEAM DEVICES.
Doctoral thesis,
by John G. Meeker. Aug 61, 220p. incl. illus. 23 refs. (Technical rept. no. 49; Rept. no. 03736-9-T)
(Contract AF 30(602)2303, Proj. 5573)
(RADC TN 61-176) Unclassified report

DESCRIPTORS: (*Electron beams, Electron tubes, Traveling wave tubes, Linear systems, Electromagnetic waves, Transmission lines, *Focusing.) (Radiofrequency, Microwaves, *Radiofrequency power, Radio signals, Electrostatics, Circuits, Magnetrons, Klystrons.) (Partial differential equations, Harmonic analysis, Series.)

The problem of phase focusing the electron clusters of linear-beam tubes is considered. In all these tubes, the continued conversion of d-c kinetic energy to r-f depends upon the successful maintenance of the center of gravity of the charge clusters in the proper phase relative to a collinear traveling wave. To the end of enhancing conversion efficiency the behavior of these devices was studied when spatially-varying parameters were inserted in either the circuit or the beam, allowing greater design control in the large-signal regions of the tubes. The detailed analysis was restricted to the traveling-wave amplifier. The large-signal equations of this device were generalized to accommodate the spatially-varying parameters. Circuit velocity could be continuously varied through the velocity parameter, b, which is redefined as a function of distance. The beam can be reimbursed with additional d-c energy by application of a d-c gradient in the force equation. The theoretical results predict that tapering of the circuit velocity of a traveling-wave amplifier will bring certain advantages. (Author)

AD-268 687 Div. 8, 5
(TISTW/DLW) OTS price $1.60

RCA Defense Electronic Products, New York.
LOW NOISE FRONT ENDS FOR TACTICAL UHF RADIO RELAY RECEIVERS.
Final rept. on Task II D, on Microwave Radio Relay Study,
by R. M. Kurzrok. 28 Sep 61, 10p. incl. illus.
(Rept. no. CR-61-419-22)
(Contract DA 36-039-sc-87240)
Unclassified report

DESCRIPTORS: (*Radio relay systems, *Radio receivers, Very high frequency, Ultra high frequency, Microwave relay systems, *Microwave amplifiers, Parametric amplifiers, Diodes, Transmission lines, Ferrites, Noise (Radio), Signal-to-noise ratio, Tests, Feasibility studies.) (Miniature electronic equipment, Amplifiers, Radio equipment, Reliability.)

Certain new devices were examined from the standpoint of low noise front end design for the proposed radio set AN/GRC-103, operating in the range 220 to 700 mc. Parametric amplifiers are not suitable for subject radio set because of size, weight and operational complexity. Tunnel diode amplifiers are not practicable due to the need for broadband ferrite circulators in the 220 mc to 700 mc frequency range. Tunnel diode downconverters look promising and should be capable of providing noise figure of about 5 db without using ferrite devices.

AD-268 693 Div. 8
(TISTE/NTM) OTS price $1.60

Stelma, Inc., Stamford, Conn.
DEVELOPMENT OF TELEGRAPH TERMINAL TH-22( )/TG.
Quarterly progress rept. no. 2, 1 June-31 Aug 61,

by R. Couturier. 31 Aug 61, 16p. incl. illus.
(Contract DA 36-039-sc-87188, Proj. 3B21-06-001)
Unclassified report

DESCRIPTORS: (Miniature electrical equipment, *Telegraph systems, *Telegraph equipment, Teletype systems, Frequency shift keyers, Voice communication systems, Band-pass filters, *Transistors, Low pass filters, Electronic circuits, Tests, Printed circuits, Design.)

Work on the TH-22( )/TG progressed from the circuit-design phase (phase 2) to the testing phase. Design of the break-in circuitry, based on use of a low-pass filter as the discriminating element, was completed. Transmitter and receiver sections were designed, breadboarded, and temperature tested. The threshold circuit was modified to increase stability. Design of carrier-suppression circuitry (based on diode gated logic) was completed, and an electronic circuit (to replace the mechanical buzzer, as requested by the Signal Corps) was developed. The chassis and the printed-circuit card assembly were designed and are in the process of being fabricated. Completed circuitry, subjected to various tests proved satisfactory. (Author)

AD-268 714 Div. 8
(TISTW/DLW) OTS price $3.60

Schwinger, Julian, Cambridge, Mass.
INVESTIGATION OF HIGH FREQUENCY LIMITATIONS IN MILLIMETER WAVE GENERATORS.
Semiannual rept. no. 1, June-Dec 61,
by Julian Schwinger. Dec 61, 31p. table, 12 refs.
(Contract DA 36-039-sc-87445, DA Proj. 3A99-13-001-05)
Unclassified report

DESCRIPTORS: (*Radiofrequency generators, *Microwaves, Electromagnetic waves, Cavity resonators, Molecular beams, Electromagnetic fields, Electromagnetic theory, Mathematical analysis, Extremely high frequency.) (*Masers, Microwave amplifiers, Signal-to-noise ratio, Theory.)

The study continued of the emission of two-level molecules in a sinusoidally driven resonant cavity. The theory was extended to allow analysis of the spectral distribution of induced and spontaneous emission in a cavity and to study the steady-state condition when a molecular beam traverses the cavity. It is shown that the induced emission energy, when averaged over a reasonable time, depends only on the energy spectrum of the driving field. Expressions are obtained for the spectral distribution of induced, spontaneous, and thermally-induced emission. The amplification by the molecular beam of the driving field (signal) and of the thermal and spontaneous emission energies (noise) is studied. (Author)

AD-268 726 Div. 8, 12, 6
(TISTE/CRJ) OTS price $3.60

Naval Research Lab., Washington, D. C.
PENETRATION OF THE IONOSPHERE BY VERY-LOW-FREQUENCY RADIO SIGNALS INTERIM RESULTS OF THE LOFTI I EXPERIMENTS.
Interim rept.,
by J. P. Leiphart, R. W. Zeek and others.
20 Nov 61, 27p. incl. illus. tables. (NRL rept. no. 5721)
Unclassified report

DESCRIPTORS: (*Radio waves, *Radio signals, Penetration, Very low frequency, *Ionosphere, *Ionospheric propagation, Electromagnetic properties, *Satellite vehicles.) (Satellite vehicles, Instrumentation, Telemetering data, Data transmission systems, Statistical analysis.)

LOFTI I is the first of a series of Navy satellite experiments designed for determination of the degree and extent of very-low-frequency (VLF) radio-wave penetration of the ionosphere. The LOFTI I telemetry records show relatively strong signals in the ionosphere from 18-kc transmitters on the terrestrial surface. The signals were attenuated less at night and appeared as far away as Australia, 10,000 miles from the transmitter. Statistical treatment of the data so far reduced shows that the attenuation of magnetic-field intensity of the 18-kc time pulses from Naval Radio Station NBA, as measured near extreme line-of-sight distances to the north of the station, was less than 13 db 50% of the time at night and less than 38 db 50% of the time during the daylight hours. The data studied so far show very little effect of altitude on signal intensity, an observation which agrees with the theoretical treatment based on a model ionosphere. The observed time delays of the 18-kc signals range from 10 to 200 milliseconds, indicating that VLF propagation velocity in the ionosphere is much lower than in free space. (Author)

AD-268 734 Div. 8
(TISTP/TL) OTS price $4.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
DESIGN STUDY OF A LINEAR ELECTRON ACCELERATOR,
by David Menaker. 18 Aug 61, 40p. incl. illus. tables, 18 refs. (Research rept. no. PIBMRI-931-61)
(Contract AF 18(600)1505)
(AFOSR-1473) Unclassified report

DESCRIPTORS: (*Electron accelerators, *Linear accelerators, Design, *Particle accelerators.) (Electron beams, Microwaves, Attenuation, Impedance, Couplings, Measurement, Energy.) (Electron accelerators, Vacuum systems, Targets, Pressure, Cooling, Shielding.) (Perturbation theory, Matrix algebra, Differential equations.) (*Microwave amplifiers, Klystrons, *Traveling wave electron accelerators.)

A linear accelerator incorporating a bar loading structure and utilizing microwave feedback is described. The characteristics of the bar structure required for the design are the attenuation length and the coupling impedance. Methods for obtaining these parameters are discussed and the pertinent measurement techniques are described. The design of the feedback loop is presented and the over-all characteristics of the accelerator with feedback is presented. Beam loading losses are introduced and the resultant output energy is calculated for different values of beam loading. These results are presented in the form of a curve which depicts the output energy as a function of accelerator length with beam loading as a parameter. The over-all system is described with particular mention of the auxiliary equipment needed for operation. (Author)

AD-268 828 Div. 8, 25
(TISTM/GEC) OTS price $6.60

Grace, W. R., and Co., Clarksville, Md.
REPRODUCIBLE THERMISTOR REFINEMENT PROGRAM.

Interim technical progress rept. 5 Sep-4 Dec 61,
by M. C. Vanik, W. T. Barrett and others.
4 Dec 61, 1v. incl. illus. tables, 184 refs.
(Contract AF 33(657)7104)
(ASD 7-838, vol. 1) Unclassified report

DESCRIPTORS: (*Thermistors, *Resistors, *Semiconductors, Single crystals, *Silicon, Impregnation, Chemical impurities, *Gold, Thermal conductivity, Sensitivity, Reliability, Manufacturing methods.) *Bibliography.

Single-crystal semiconductor Si, because of its purity, resistivity, energy gap, and availability, is an outstanding candidate for monocrystalline-thermistor development. Au-doped monocrystalline-semiconductor Si should produce thermistors which are highly reproducible, predictable, and sensitive over the range of -85 to +200 C. By varying the Si type and the amount of Au dopant, a series of thermistor materials of different sensitivities and resistivities are obtainable. Au can be easily introduced in single-crystal Si by float zone leveling, diffusion, or crystal pulling techniques. A statistical study indicated that float zone leveling produces the least variable product. (Author)

AD-268 843 Div. 8
(TISTA/VGW) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
PROJECT ECHO, THE DUAL CHANNEL 2390-MC TRAVELING-WAVE MASER,
by R. W. DeGrasse, J. J. Kostelnick, and H. E. D. Scovil. Dec 61, 11p. incl. illus. 6 refs.
(NASA Technical note D-1132)
(In cooperation with Bell Telephone Labs., Whippany N. J., Contract NASw-110)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1132.

DESCRIPTORS: (Traveling wave tubes, Microwave amplifiers, S band, Ruby, *Masers, Design, Microwave communication systems, Microwave relay systems, Tests.) (Satellite vehicles, Balloons, Radar tracking.)

Reflected 2390-mc signals from the Echo I satellite were received by a horn-reflector antenna and amplified by solid state traveling-wave masers. This paper describes the design of the dual channel maser amplifiers for this experiment. Each maser has sufficient gain (> 33 db) to override the noise of the following stage. Unconditional stability is obtained by the use of distributed ferrimagnetic isolator elements. Their instantaneous bandwidth is 13 mc, centered at 2390 mc. The effective input noise temperature is 8 K. (Author)

AD-268 906 Div. 8, 30
(TISTP/MFA) OTS price $1.60

David Sarnoff Research Center, Princeton, N. J.
MAJORITY LOGIC BY GEOMETRIC METHODS,
by H. S. Miller and R. O. Winder. 13 July 61, 6p. illus. 5 refs. (Scientific rept. no. 4)
(Contract AF 19(604)8423)
(AFCRL-792) Unclassified report

DESCRIPTORS: (*Electrical networks, Computers, *Computer logic, Synthesis.) (Switching circuits, Functions, *Algebraic geometry.)

The usefulness of a geometric approach to the following problem is presented: Given an n-argument switching function and i-input majority gates as building blocks, devise a network which represents the given function. This problem has been treated algebraically. Two-level realizations will be derived, and problems with larger values of n and i are considered. In these cases, multi-level realizations must be permitted. The synthesis procedures described employ geometric intuition (namely, matching known patterns with given patterns), and do not guarantee optimal solutions. (Author)

AD-268 907 Div. 8, 30, 5
(TISTP/MFA) OTS price $3.60

David Sarnoff Research Center, Princeton, N. J.
MAJORITY GATE NETWORKS,
by S. Amarel, G. Cooke, and R. O. Winder.
24 Aug 61, 30p. incl. illus. 6 refs. (Scientific rept. no. 5)
(Contract AF 19(604)8423)
(AFCRL-793) Unclassified report

DESCRIPTORS: (*Electrical networks, Computers, *Communications theory, Reliability, Design, Analysis, Switching circuits, *Computer logic.)

The problem of majority gate networks is discussed. A majority network of order n has (2n-1) inputs and produces an output (it fires) when n of its inputs are excited (are fired). The problem of constructing such a network from smaller majority gates arises because in a large number of cases the network is not physically realizable with a single (2n-1) input gate; this is due to the limited signal resolution possible in a practical electronic device. Suppose someone were to develop an extensive body of logical design theory employing five-input majority gates; and suppose a very fast device were developed which acted also as a majority gate, but could accept only three inputs reliably. Clearly, then, an appropriate answer to the problem that we have posed previously might allow direct application of the new device in already familiar networks. (Author)

AD-268 910 Div. 8
(TISTE/CDM) OTS price $4.60

Electronics Research Lab., U. of Calif., Berkeley.
STUDY OF FREQUENCY INDEPENDENT ANTENNAS.
Final rept., 1 May 60-30 June 61,
by V. H. Rumsey, W. J. Welch and others.
15 Oct 61, 35p. incl. illus. 12 refs.
(Contract DA 36-039-sc-84923)
Unclassified report

DESCRIPTORS: (Antennas, *Antenna radiation patterns, Polarization, Impedance.) (*Helical antennas, Phase measurement, Theory, Design, X band, Mathematical analysis.) (Antenna couplers, Waveguides, Tests, Measurement.) (Antenna radiation patterns, Test equipment, Recording devices.)

An investigation was made of frequency-independent antennas from the point of view of designing the antennas for any radiation pattern and polarization. Solutions of Maxwell's equations were discovered which explain the theory of frequency independent antennas. The effect of curvature

on the current distribution is strikingly demonstrated but the most remarkable feature is the incoming current wave at large distances, when the angular phase velocity of the excitation is in the direction of decreasing radius along an equiangular spiral. Solutions for periodic antennas were also obtained and extensive computations are being made. (Author)

AD-268 922 Div. 8, 15
(TISTE/CRJ) OTS price $10.50

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
MATHEMATICAL MODELS FOR SOME RADIO-FREQUENCY TRANSMISSION-LINE TRANSFORMERS.
Master's thesis,
by Charles Anthony Davidson. Aug 61, 124p. incl. illus. tables (Rept. no. GE/EE/61-3)
Unclassified report

DESCRIPTORS: (*Radiofrequency transformers, *Phase shifters, *Transmission lines, Ferrites, Dielectric properties, Broadband, Impedance, Impedance matching, *Matrix algebra, Mathematical analysis.)

Mathematical models and a method for analysis are developed for the broadband reversing, 4:1 impedance-matching, grounded and ungrounded radio-frequency transmission-line transformers. From the mathematical models the frequency dependence of the parameters of these 4 transformers is predicted and depicted graphically. The development of the mathematical models is based on an empirical analysis of matrix elements derived by space structure techniques. Design of an audio-frequency transmission-line transformer is considered and found to be not presently feasible. The applicability of space structure techniques to the derivation of matrix elements for transmission-line transformers is established. (Author)

AD-268 923 Div. 8, 30
(TISTE/CRJ) OTS price $4.60

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
DESIGN TECHNIQUES FOR SEVERAL MOLECULAR-ELECTRONIC CIRCUITS WITH THE CONTROLLED-FIELD APPROACH.
Master's thesis,
by Ruel Dudley Burnham. Aug 61, 40p. incl. illus. tables (Rept. no. GE/EE/61-2)
Unclassified report

DESCRIPTORS: (*Subminiature electronic equipment, *Electronic circuits, Switching circuits, Trigger circuits, Triggered gates, Semiconductors.) (Circuits, *Digital computers, *Pulse generators, *Audio amplifiers, Linear systems, Transistors.)

The controlled-field circuit technique eliminates the need for discrete resistive paths. Applying this technique to molecular electronics can reduce the complexity of the circuit. In a controlled field circuit, the sources and active elements are connected at the proper points to obtain the correct biasing of active elements as well as the required relationship between input and output. Controlled-field circuits were designed for linear amplifiers, bistable multivibrators, NOR-logic, and exclusive-OR. The designs were done experimentally on resistive paper. Construction of these circuits into a molecular-electronic configuration was not attempted. (Author)

AD-268 924 Div. 8, 25, 26
(TISTE/NTM) OTS price $1.60

Knights, James, Co., Sandwich, Ill.
VHF QUARTZ CRYSTAL UNITS CR-(XM-38)/U 150 mc to 200 mc.
Quarterly rept. no. 1, 1 July-1 Oct 61 on Production Engineering Measure.
1 Oct 61, 14p. incl. illus.
(Contract DA 36-039-sc-85973)
Unclassified report

DESCRIPTORS: (*Quartz crystals, *Crystal oscillators, Very high frequency, Design, Manufacturing methods, Production.) (Crystals, Crystal holders, Oscillators, Radiofrequency oscillators.)

Research concerns the development of techniques necessary to fabricate and evaluate 9th overtone units from 150 to 200 mc. Units were fabricated on all 5 frequencies and measured on the 5th overtone in the TS-683. (Author)

AD-268 936 Div. 8, 12
(TISTE/CRJ) OTS price $4.60

New Hampshire U., Durham.
INSTRUMENTATION FOR THE AUTOMATIC DOPPLER TRACKING OF EARTH SATELLITE RADIO SIGNALS,
by Alan C. Marshall and Robert E. Houston.
July 61, 38p. incl. illus., 1 refs. (Scientific rept. no. 1)
(Contract AF 19(604)4145)
(AFCRL-1054) Unclassified report

DESCRIPTORS: (Automatic, *Doppler tracking of *Satellite vehicles, Instrumentation.) (Frequency shift of *Radio signals from Satellite vehicles.) (*Radio receivers, Dipole antennas, Radiofrequency oscillators.) (Radio transmission, *Radio reception.)

Instrumentation describing a means of automatically tracking the Doppler frequency shift of a satellite passing overhead is described. The equipment proved to be reliable, simple to operate, and effective, in performing the task for which it was designed. Certain changes were indicated should a more sophisticated phase-locked system be desired. It is concluded that high gain, narrow bandwidth receivers, with consequent over-all system gain, coupled with this, or some similar, automatic tracking of Doppler frequency shifts can be utilized to make observations on the relatively low frequency, low power beacon satellites which should be forthcoming. (Author)

AD-268 961 Div. 8, 26
(TISTW/DLW) OTS price $5.60

Army Signal Research and Development Lab., Fort Monmouth, N. J.
PREPARATION AND EVALUATION OF VACUUM-DEPOSITED

THIN-FILM CAPACITORS,
by Hans J. Degenhart and Isaac H. Pratt.
July 61, 53p. incl. illus. tables, 7 refs.
(ASRDL Technical rept. no. 2228)
Unclassified report

DESCRIPTORS: (*Subminiature electronic equipment, *Capacitors, *Thin films, Dielectric films, Ferroelectric materials, Silicon compounds, Monoxides, Coatings, Preparation, Processing, *Manufacturing methods.) (Electronic circuits, Surface properties, Design, Electrical properties, Physical properties, Tests.)

Results of statistical studies on the preparation and evaluation of thin-film capacitors are discussed. The dielectric material used was silicon monoxide (SiO). Data on single-layer capacitors are presented with results are discussions of multilayered thin-film capacitors. Thin films of SiO were vacuum deposited in up to seven stacked layers separated by aluminum film electrodes, onto supporting substrates of different surface characteristics. Parameters studied include thickness (interferometrically determined; ranges for a single dielectric film layer from 1,000 to 20,000 Angstroms), capacitance, dissipation factor, leakage current, insulation resistance, dielectric breakdown strength, temperature coefficient, probability distribution for studied parameters, and geometry dependence. Results demonstrate the feasibility of multilayering thin-film capacitors by vacuum deposition techniques in the order of the above thicknesses, and indicate potential application to the Signal Corps Micro-Module program. (Author)

AD-268 993 Div. 8, 25
(TISTP/WH) OTS price $1.25

Airborne Instruments Lab. Div. of Cutler-Hammer, Inc., Deer Park, Long Island, N. Y.
FURTHER DEVELOPMENT OF MICROWAVE GAMMA-RAY ION CHAMBER.
Rept. for Dec 59-Apr 61,
by J. W. Aichroth, R. L. Sleven, and K. C. Speh.
Aug 61, 44p. incl. illus. tables, 10 refs.
(Contract AF 33(616)6971, Proj. 7360)
(ASD TR 61-32) Unclassified report

DESCRIPTORS: (Gamma rays, *Gamma counters, *Ionization chambers, Cavity resonators.) (*Cavity resonators, Neutron flux density, Radiation effects, Electromagnetic effects, Attenuation, Impedance.) (High temperature research, Radiation counters.)

A microwave gamma-ray ion chamber has been developed that measures gamma radiation from 10 to the 6th to 10 to the 10th power ergs per gram-hour (carbon) in the presence of a neutron flux of 10 to the 10th power neutrons per square cm per second. This analysis discusses the choice of materials, development of a unique vacuum system, and fabrication of chambers suitable for operation at temperatures to 500 C in a high neutron flux. Data are presented on the response of an ion chamber to various ratios of incident gamma, thermal neutron, and fast neutron fluxes. (Author)

9. FLUID MECHANICS

AD-268 137 Div. 9
(TISTP/MFA) OTS price $1.25

National Aeronautics and Space Administration, Washington, D. C.
CROSS-SECTIONAL DEFORMATIONS OF MONOCOQUE BEAMS AND THEIR EFFECTS ON THE NATURAL VIBRATION FREQUENCIES,
by Robert G. Thomson and Edwin T. Kruszewski. Dec 61, 45p. incl. illus. (NASA Technical note D-987)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-987.

DESCRIPTORS: (*Deformation, *Beams, Flutter, *Monocoques, Vibration, Frequency, Tests.) (Shear stresses, Aerodynamics, Aerodynamic configurations, Flutter, Resonance.) (Matrix algebra, Differential equations, Integrals.)

The variational principle, differential equations, and boundary conditions governing the cross-sectional distortions due to inertia loading of a two-dimensional model of a thin monocoque wing are shown. A theoretical analysis of this simplified model is made to determine the nature of the coupling between the cross-sectional modes and the spanwise deformation modes. General solutions are obtained in finite-difference form for arbitrary cross sections and an exact solution is presented for a parabolic-arc cross section of constant cover thickness. The application of these results in evaluating the coupled frequencies of the actual structure is discussed. Frequencies evaluated for a parabolic-arc monocoque beam show good agreement with experimental values. (Author)

AD-268 138 Div. 9
(TISTA/SEB) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
STUDY OF FLOW OVER OSCILLATING AIRFOIL MODELS AT A MACH NUMBER OF 7.0 IN HELIUM,
by Ali Arman. Dec 61, 21p. incl. illus. tables, 10 refs. (NASA Technical note D-992)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-992.

DESCRIPTORS: (*Airfoils, Wedges, Blunt bodies, Gas flow, Shock waves, *Hypersonic flow, Hypersonics, Dynamics, Boundary layer, Deflection, Oscillation, Flutter, Stability, Stability (Lateral), Stability (Longitudinal), Damping, Vibration, Tests, Theory.) (Model tests, Wind tunnel models, Helium.)

A wind-tunnel study of unsteady flow at a Mach number of 7 in He was conducted on several sting-mounted wedge, double-wedge, and flat-plate airfoil models with 3 different leading-edge radii. Data were obtained by taking high-speed schlieren motion pictures of the decaying motion of the model as it was released from an initial deflection. The shock-wave position observed on the sharp-leading-edge models during the oscillation was compared with that obtained by use of unsteady-flow theory as well as steady-state theory. Comparison of theoretical results indicated that no unsteady-flow effects exist over the range of reduced frequencies k, 0.007 is equal to or less than k is equal to or less than 0.030, studied experimentally. Results confirmed the finding as no unsteady-flow effects were detected in this reduced-frequency range. Comparison of shock-wave positions measured for the blunt models with those calculated by steady-state methods indicated fair agreement. (Author)

AD-268 142 Div. 9
(TISTA/SEB) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
LONGITUDINAL FORCE AND MOMENT DATA AT MACH NUMBERS FROM 0.60 to 1.40 FOR A FAMILY OF ELLIPTIC CONES WITH VARIOUS SEMIAPEX ANGLES,
by Louis S. Stivers, Jr., and Lionel L. Levy, Jr. Dec 61, 35p. incl. illus. tables, 16 refs. (NASA Technical note D-1149)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1149.

DESCRIPTORS: (*Conical bodies, Subsonic flow, Supersonic flow, Supersonics, Aerodynamics, Lift, Pitch, Drag, Moments.)

An investigation was made to determine the aerodynamic characteristics of 4 elliptic cones having plan-form semipex angles ranging from about 9 to 31 degrees, and also for 1 of the cones modified on the upper surface to reduce the base area by about 1/2. Tests were made for angles of attack from about -2 to +21 degrees, at Mach numbers from 0.60 to 1.40, and for a constant Reynolds number of 1.4 million, based on the length of the models. For each model, lift, pitching-moment, and drag coefficients, and lift-drag ratios are presented for the forebody, and axial-force coeffficients are presented for the base. Calculated lift and pitching-moment curves for the elliptic cones, and lift-curve slopes for each model at supersonic Mach numbers are shown for comparison with the corresponding experimental values. Lift-drag ratios are also given for the forebody and base combined. These data are presented without discussion. (Author)

AD-268 143 Div. 9, 1
(TISTP/JW) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
FORCES AND MOMENTS ON SPHERE-CONE BODIES IN NEWTONIAN FLOW,
by Robert R. Dickey. Dec 61, 17p. incl. illus. (NASA Technical note D-1203)
Unclassified report

Also available from NASA Wash. 25, D. C., as NASA Technical note D-1203.

DESCRIPTORS: (*Spheres, Conical bodies, Aerodynamic configurations, Impact shock.) (Lift, Drag, Gravity.) (Angle of attack indicators, *Aerodynamic configurations.) (Fluid mechanics, Atmosphere entry.)

The bodies considered consist of a sphere with a converging conical afterbody and have fineness ratios from 1.0 to 6.0. The effects of angle of attack, fineness ratio, and center-of-gravity location are shown. With the center of gravity at or near the center of volume, the results indicate that the sphere-cone combinations are statically stable at trim points that provide low to moderate lift-drag ratios. (Author)

Division 9 - FLUID MECHANICS

AD-268 178 Div. 9
(TISTA/VGW) OTS price $3.60

Syracuse U. Research Inst., N. Y.
THE SAMPLING OF AEROSOLS IN A TURBULENT AIR FLOW.
Progress rept. no. 6, 1 Sep-30 Nov 61,
by V. Goldschmidt. 30 Nov 61, 23p. illus.
7 refs.
(Grant DA-CML-18-108-61-G-27)
Unclassified report

DESCRIPTORS: (*Aerosols, Gas flow, Turbulent flow, Anemometers, Sampling, Counting methods for Density, Frequency.) (Drops, Particles, Detectors, Temperature sensitive elements, Effectiveness, Mathematical analysis.)

The application of a hot wire anemometer as a sampling device for a dibutyl phthalate aerosol was found reliable. The count obtained by particles impacting on the heated filament in laminar flows showed a direct correlation to the concentrations measured by two other means. In the runs conducted, counts as high as 1000 per second per inch of wire length were noted and it was estimated that all drops above 3 to 5 microns were counted. With proper filtering of undesirable noise and slight improvements on the present set-up, the size of droplets to cause a countable signal will be lowered, and the application of the instrument hence broadened, improved, and extended to turbulent streams. An analysis is shown perturbing the equations of motion for an aerosol in air, attempting to arrive at the important Reynold's type equations. The resulting differential equation has both Lagrangian and Eulerian terms which do not immediately yield the corresponding correlating terms. (Author)

AD-268 233 Div. 9
(TISTA/VGW) OTS price $8.10

General Dynamics/Convair, San Diego, Calif.
FLAPPED HYDROFOILS IN SMOOTH WATER SUBCAVITATING FLOW,
by C. E. Jones, Jr. Nov 61, 83p. incl. illus. tables (Rept. no. ZH-153)
(Contract Nonr-318000, Proj. NR 062-252)
Unclassified report

DESCRIPTORS: (Hydrodynamics of *Hydrofoils, *Flaps.) (Underwater, Model tests of Control surfaces for Drag, Lift, Pitch, Moments, Load distribution, Gust loads, Pressure, Measurement on Flaps, Configuration, Design, Effectiveness.) (Aerodynamic configurations, Aerodynamic data, Theory, Mathematical analysis, Mathematical prediction.) Model basins, Test facilities, Instrumentation.

Results of towing-tank tests on a 4-inch chord, 24-inch span, single-strut mounted, plain-flapped hydrofoil model, having an NACA 16-309 wing section, are reported. The hydrofoil model was constructed for tests on four flap sizes. Results are presented in coefficient form. Comparisons are made with aerodynamic data and theory. Results include curves of hydrofoil lift, drag, and pitching moment coefficient; flap normal, and chord force coefficient; hinge moment coefficient; and flap effectiveness. (Author)

AD-268 259 Div. 9, 24
(TISTP/MFA) OTS price $2.60

Naval Ordnance Test Station, China Lake, Calif.
UNDERWATER FLOW VISUALIZATION TECHNIQUES,
by Wallace H. Allan. 29 Aug 61, 28p. incl. illus. 4 refs. (NOTS TP 2759)
(In cooperation with Fisheries Research Inst., U. of Washington, Seattle)
(NAVWEPS rept. no. 7778)
Unclassified report

DESCRIPTORS: (*Schlieren photography, *Fishes, *Fluid flow, Turbulent flow, Boundary layer, Laminar boundary layer, Visibility.) (Color photography, Photographic analysis, Laboratory equipment, Experimental data.)

Flow visualization techniques useful for studies of models and live fish, have been developed by the Naval Ordnance Test Station in conjunction with the Fisheries Research Institute of the University of Washington. General patterns of the flow around fish are shown by means of flow marker techniques. Because of the incompatibility of the fish with flow markers, these techniques were not entirely successful. Boundary layer phenomena are shown by means of a Schlieren technique. The Schlieren technique appears to be a powerful new tool for boundary layer studies. (Author)

AD-268 276 Div. 9, 25
(TISTP/MFA) OTS price $2.60

Illinois U., Urbana.
ANALYTICAL STUDY OF THE BEHAVIOUR OF FLUIDS IN POROUS SOLID MEDIA.
Quarterly progress rept. no. 8, 1 June-31 Aug 61,
by Walter Rose. 5 Dec 61, 113p. incl. illus. tables.
(Contract DA 18-108-405-cml-517)
Unclassified report

DESCRIPTORS: (Fluids, *Fluid mechanics, *Porous materials, *Solids.) (Gas flow, Transport properties, Compressible flow, *Hydrodynamics.) (Wetting agents, Surface properties, Capillary tubes, Viscosity, Liquids.) (Equations of state, Kinetic theory, Partial differential equations, Linear systems, Polynomials.) (Digital computers, Programming, Experimental data.)

Progress is reported for work in the following areas: (1) Synthesis of the dynamics of capillary inhibition, (2) discussion of the form of fluid-fluid interfaces in unsteady motion, (3) Discussion of the problem of viscous fingering, (4) A statement of the physics of immiscible fluid-fluid displacement, (5) Network model theory, (6) Generalized flow problems, (7) Elementary cases of capillary flow, (8) Spectural analysis of the structure of porous media, and (9) Numerical integration of the equations of Stokes-Navier. (Author)

AD-268 299 Div. 9, 15
(TISTP/TL) OTS price $13.50

Air Force Special Weapons Center, Kirtland Air Force Base, N. Mex.
AFSWC SECOND HYDRODYNAMIC CONFERENCE NUMERICAL METHODS OF FLUID FLOW PROBLEMS 16-18 MAY 1961,
comp. by John C. Rich. 1961, 192p. incl. illus.
(AFSWC TN 61-29, pt. 1)
(Proj. no. 5776)
Unclassified report

DESCRIPTORS: (*Hydrodynamics, *Conferences, *Fluid flow, *Numerical methods and procedures, Magnetohydrodynamics.) (Differential equations, Astrophysics, Boundary layer, Gas ionization, Magnetic fields, Plasma physics, Shock waves, X rays, Numerical analysis, Integration, Particles, Velocity.)

Numerical techniques for solving fluid flow problems were discussed. Papers dealt with the problems of the finite difference analogs of the differential equations of motion and work toward analytic solutions of these equations. Topics included hydrodynamics, magnetohydrodynamics, radiation transport, and solid material motion. (Author)

AD-268 321 Div. 9, 12, 15
(TISTP/WH) OTS price $2.60

Grumman Aircraft Engineering Corp., Bethpage, N. Y.
SUCCESSIVE APPROXIMATION TECHNIQUES FOR TRAJECTORY OPTIMIZATION,
by Henry J. Kelley, Richard E. Kopp, and H. Gardner Moyer. 1961, 14p. illus. 11 refs. (Contract Nonr-338400)
Unclassified report

Presented at the IAS Vehicle Systems Optimization Symposium, November 28-29, 1961, Garden City, New York.

DESCRIPTORS: (*Orbital flight paths, Mathematical analysis, Calculus of variations, Numerical methods and procedures.) (*Guided missile trajectories, *Satellite vehicle trajectories, Mathematical analysis, Inequalities, Differential equations.) (Earth, Mars, Digital computers.)

Three related successive approximation schemes for determination of optimal trajectories are developed with attention to treatment of inequality constraints on control variables. The first is a gradient method based upon a Euclidean metric with appropriate modification for handling of inequalities; the second employs a Min operation without use of a metric; and the third features a special integral-absolute value metric. The Pontryagin Principle is employed for construction of successive control function approximations. All three schemes employ an adjoint system for computation of influence functions and a penalty function technique for handling of constraints on terminal values. Illustrative calculations are presented for planar Earth-Mars transfer. The relative merits of the techniques are discussed from the viewpoint of digital computation. (Author)

AD-268 344 Div. 9, 25
(TISTA/WAW) OTS price $1.25

National Aeronautics and Space Administration, Washington, D. C.
EXPERIMENTAL STUDY OF COMBINED FORCED AND FREE LAMINAR CONVECTION IN A VERTICAL TUBE,
by Theodore M. Hallman. Dec 61, 25p. incl. illus. 15 refs. (NASA Technical note D-1104)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1104.

DESCRIPTORS: (Hydrodynamics, *Fluid flow, Fluid mechanics, *Convection, Heat transfer, Pipes, Liquids, Measurement, Tests.) Jet propulsion, Nuclear propulsion.

Experiments showed that fully developed heat-transfer results, predicted by a previous analysis, were confirmed over the range of Rayleigh numbers investigated. The concept of locally fully developed heat transfer was established. Thermal entrance region data were obtained for pure forced convection and for combined forced and free convection. The analysis of laminar pure forced convection in the thermal entrance region conducted by Siegel, Sparrow, and Hallman (Appl. Sci. Res., Sec. A, Vol. 7, No. 5, 386-392, 1958) was experimentally confirmed. A transition to an eddy motion, indicated by a fluctuation in wall temperature, was found in many of the upflow runs. A stability correlation was found. The fully developed Nusselt numbers in downflow were below those for pure forced convection but fell about 10 percent above the analytical curve. Quite large circumferential variations in wall temperature were observed in downflow as compared with those encountered in upflow. With larger heating rates in downflow the wall temperature distributions strongly suggested a cell flow near the bottom. At still larger heating rates the wall temperatures varied in a periodic way. (Author)

AD-268 346 Div. 9
(TISTP/MFA) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
ANALYSIS OF HEAT TRANSFER AND PRESSURE DROP FOR A GAS FLOWING THROUGH A SET OF MULTIPLE PARALLEL FLAT PLATES AT HIGH TEMPERATURES,
by Thomas H. Einstein. Dec 61, 40p. incl. illus. 10 refs. (NASA Technical note D-1165)
Unclassified report

DESCRIPTORS: (*Heat transfer, *Pressure, *Reduction, Analysis, Gas flow, Sheets, *High temperature research.) (Turbulent flow, Laminar boundary layer, Thermodynamics.) (Partial differential equations, Polynomials, Matrix algebra, Computers.)

Equations are derived for heat transfer and pressure drop in a gas flowing through a heater composed of parallel, heat generating, flat plates operating at high temperatures. The effect of radiation between the plates is considered. The resulting equations were solved on an IBM 704 computer for a series of cases in which hydrogen was the working fluid with gas inlet and exit temperatures of 200 and 5000 R. The results presented are maximum plate temperature, flow distribution between the plates, and over-all pressure drop. The results also show the effects of laminar and turbulent flow, of changing the length to equivalent diameter ratio of the heater passages, and of varying the emissivity and number of the plates. (Author)

AD-268 352 Div. 9
(TISTA/WAW) OTS price $1.10

Polytechnic Inst. of Brooklyn, N. Y.
ON VISCOUS WAKES OF YAWED INFINITE CYLINDERS AND ANALOGOUS JETS,

by Martin H. Bloom. Nov 61, 4p. 2 refs.
(PIBAL rept. no. 730)
(Contract AF 49(638)445, Proj. 9781)
(AFOSR-1731) Unclassified report

DESCRIPTORS: (Bodies of revolution, *Cylindrical bodies, *Wake, *Fluid flow, *Viscosity, Mathematical analysis.) (Re-entry vehicles, Re-entry aerodynamics, Aerodynamics.) (*Flame holders, Gas flow, Jets.)

Boundary layers over yawed infinite cylinders whose inviscid properties are spanwise-invariant, and whose surface conditions are uniform, have received considerable attention. Analogous treatment may be accorded the viscous wakes of such cylinders, which are of interest, for instance, in connection with flame holders or observables of high speed bodies at angle-of-attack. (Author)

AD-268 354 Div. 9, 25
(TISTA/SEB) OTS price $5.60

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
THE THERMAL ACCOMMODATION COEFFICIENT: A CRITICAL SURVEY,
by H. Y. Wachman. Dec 61, 44p. illus. 80 refs.
(Rept. no. R61SD197)
Unclassified report

DESCRIPTORS: (Gases, *Superaerodynamics, Aerodynamic heating, Fluid flow, *Drag, Energy, *Thermal conductivity, Heat transfer to Satellite vehicles, Theory, Mathematical analysis, Test methods, Test equipment.)

Accommodation coefficient (alpha) values which can be confidently applied to a solution of satellite-drag and heat-transfer problems must be obtained from experiments with gas molecules whose velocities match those of satellites. The problem of generating in the laboratory a nearly monoenergetic beam of molecules in the range 1 - 10 eV with adequate flux has not been solved. Experimental facilities such as shock and arc tunnels which may produce molecular flows of nearly adequate velocities are not readily adaptable to alpha measurements. For these measurements the transient flow obtained in a shock tunnel is extremely inconvenient, while the composition and energy distribution of the gas obtained in an arc tunnel is not known with sufficient accuracy. The composition of a satellite surface in orbit, and hence the accommodation coefficient, will most probably differ appreciably from that of an untreated surface of the same material exposed to a laboratory vacuum of, say only, 10 to the -7th power mm of Hg. Furthermore, in orbit, satellite surface composition may change with changing surface temperature and ambient gas pressure, resulting in corresponding changes in alpha. (Author)

AD-268 377 Div. 9, 31
(TISTP/MFA) OTS price $7.60

Davidson Lab., Stevens Inst. of Tech., Hoboken, N. J.
PRESSURE FIELD NEAR COUNTERROTATING PROPELLERS,
by S. Tsakonas and J. P. Breslin. Sep 61, 32p. illus. tables, 10 refs. (Rept. no. 858)
(Contract Nonr-26316, Proj. S-R009-01-01)
Unclassified report

DESCRIPTORS: (*Marine propellers, *Dual rotation propellers, Propeller blades, Vibration, Pressure, Torque, Vortices, Wake, *Hydrostatic pressure.) (Harmonic analysis, Transformations (Mathematics), Bessel functions, Fourier analysis.)

Expressions for the vibratory pressure field produced by an operating counterrotating propeller system are developed in terms of first and second blade harmonics of individual propellers. The coefficients of the first and second blade harmonics of a 3-bladed propeller are expressed in closed form in terms of complete elliptic integrals. It is found that the pressure signal due to a counterrotating propeller can be obtained from the summation of the pressure fields of its two components as though the two propellers operate as separate units, since their mutual interference was found to contribute little to the total vibratory pressure signal in the near field. This study indicates that the counterrotating propeller system has vibratory characteristics much superior to an equivalent single propeller having the number of blades of one of its components, delivering the same thrust at the same RPM at optimum conditions. A study of the interference effects by means of a two-dimensional analogue indicates that the effect of the forward propeller on the aft is much greater than the effect of the aft propeller on the forward propeller. (Author)

AD-268 391 Div. 9
(TISTP/MFA) OTS price $5.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
SOME EXPERIMENTS ON IMPACT-PRESSURE PROBES IN A LOW-DENSITY, HYPERVELOCITY FLOW,
by A. B. Bailey and D. E. Boylan. Dec 61, 53p. incl. illus. tables, 17 refs. (Rept. no. AEDC TN 61-161)
(Contract AF 40(600)800, Proj. 8950)
Unclassified report

DESCRIPTORS: (Impact tubes, *Pitot tubes, Pressure, Density, *Hypersonic flow, Orifices, Gas flow.) (Instrumentation, Transducers, Valves, Vacuum pumps.) (Experimental data, Tables.) (*Hypersonic wind tunnels, Instrumentation, Pressure, Measurement.)

An experimental investigation of the behavior of flat-faced, impact-pressure probes with a range of orifice-to-probe diameter ratios was made in heated nitrogen, where Mach number was 9.3, stagnation temperature was 3000 K, and the unit Reynolds number was 260/in. It was found, contrary to experience in low-density, unheated flows, that the impact pressure decreased with a reduction in orifice diameter for a fixed probe outer diameter in these tests. A discussion of the factors which could cause this decrease is contained herein. An analysis of the data indicates that in order to obtain as accurate a value of impact pressure as possible in low-density, hypervelocity flows, attention must be given to a number of factors, including viscous effects, thermal gradient effects, probe shape, thermal or chemical nonequilibrium, and non-continuum fluid phenomena. (Author)

AD-268 459 Div. 9, 25
(TISTP/WH) OTS price $2.60

Magnetogasdynamics Lab., Mass. Inst. of Tech., Cambridge.
HEAT TRANSFER IN A COMPLETELY IONIZED GAS,

by Brit-Marie Jepson. July 61, 5p. incl. illus. 5 refs. (Rept. no. 61-7)
(Contract AF 49(638)643, Proj. 9781)
(AFOSR-1562) Unclassified report

DESCRIPTORS: (*Heat transfer, Gases, Sheets, Solids.) (Gases, *Laminar boundary layer.) *Gases, Ions, Thermal diffusion, *Transport properties, Heat transfer.) (Integration, Numerical methods and procedures.)

Heat transfer rates and temperature profiles were calculated for a completely ionized gas in laminar boundary layer flow over a flat plate. Using the assumptions of low Mach number, zero Prandtl number, and no pressure gradient, the solutions were obtained by numerical integration of the differential energy equation utilizing an iterative method of solution. The gas considered was treated as a homogeneous perfect gas under no electric or magnetic fields. The thermal conductivity of the gas was assumed to vary as the absolute temperature to the B power. Solutions were obtained for B = 5/2 (completely ionized gas) as well as for B = 1 and 1/2 for comparison with other solutions. By an approximate method of solution, a simple relationship for the heat transfer rate was found which depends upon B and the ratio of wall temperature to free stream temperature. (Author)

AD-268 484 Div. 9
(TISTA/VGW) OTS price $2.60

Research and Advanced Development Div., AVCO Corp., Wilmington, Mass.
CRITICAL AERO-THERMODYNAMIC PARAMETERS IN THERMAL PROTECTION DESIGN OF SPACE RE-ENTRY BODIES. PART I.
Technical rept.,
by Henryk Hurwicz and John D. Brown. 30 June 61, 23p. incl. illus. 9 refs. (Rept. no. RAD-TR-61-18; Thermodynamics Analysis Section rept. no. 745)
(Contract AF 04(647)258, Proj. WS 133A)
Unclassified report

DESCRIPTORS: (Superaerodynamics, Thermodynamics, Re-entry aerodynamics, *Re-entry vehicles, *Thermal insulation, Shielding for Aerodynamic heating.) (Ablation, Heat transfer, Thermal conductivity, Surface properties of Refractory materials, Mathematical analysis, Mathematical prediction of Effectiveness.)

A systematic study of the thermal environment of a re-entering body is made to determine significant parametric interactions of material thermal properties, ablation characteristics (heat of ablation), and aerodynamic heating. The effect of these factors and of their significant interactions on the shield design is analyzed. The investigation is concerned primarily with the thermal efficiency of the heat shields. It provides systematic trend information on effects of important parameters encountered in the heat-shield design, and a guide to selection of general classes of materials. The results may be used for preliminary design purposes. (Author)

AD-268 497 Div. 9
(TISTA/WAW) OTS price $8.10

Guggenheim Aeronautical Lab., Calif. Inst. of Tech., Pasadena.
SUPERSONIC FLUTTER OF A CYLINDRICAL SHELL OF FINITE LENGTH IN AN AXISYMMETRICAL MODE,
by Hans Krumhaar. Oct 61, 78p. incl. illus. tables, 17 refs.
(Contract AF 49(638)220)
(AFOSR-1574) Unclassified report

DESCRIPTORS: (Elastic shells, *Cylindrical bodies, Bodies of revolution, Aerodynamics, Supersonics, *Flutter, Mathematical analysis, Differential equations, Partial differential equations, Integral equations.)

The flutter in an axisymmetrical mode of a simply supported cylindrical shell is studied. The linearized Timoshenko shell equations and linear piston theory lead to a non-self-adjoint eigenvalue problem, which has been solved without further approximations. Using these exact solutions two checks can be made. A comparison of the exact result with those obtained by Galerkin's method proves whether or not this method is reliable if applied to the present eigenvalue problem. On the other hand, a comparison of the exact results with experimental data will prove whether or not the basic physical assumptions are satisfactory. (Author)

AD-268 548 Div. 9, 4
(TISTP/MFA) OTS price $1.50

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
A METHOD FOR THE CALCULATION OF NON-EQUILIBRIUM ELECTRON DENSITIES IN HIGH TEMPERATURE AIR,
by M. H. Bortner. Feb 61, 18p. 8 refs. (Rept. no. TIS R61SD22)
(Contract AF 04(647)269)
Unclassified report

DESCRIPTORS: (*Re-entry aerodynamics, Gas flow, Flight paths, Guided missiles.) (Chemical reactions, Reaction kinetics, *Chemical equilibrium, Electrons, Density, Gas ionization, Dissociation, Transport properties, Recombination reactions, Kinetic theory, High temperature research.) (Experimental data, Tables.)

A method is developed for the calculation of the chemical kinetics of high temperature air and is applicable to re-entry flow fields. The actual chemical system which should be used is considered in detail. (Author)

AD-268 584 Div. 9, 25
(TISTP/JW) OTS price $5.60

Flight Dynamics Lab., Aeronautical Systems Div., Wright-Patterson AZir Force Base, Ohio.
COMPRESSIBLE BOUNDARY LAYER EQUATIONS AND STAGNATION POINT SOLUTION WITH DIFFERENCES IN THERMAL AND DYNAMIC BOUNDARY LAYER THICKNESSES BEING CONSIDERED.
Rept. on Aerodynamics and Flight Mechanics,
by Melving L. Buck, Aug 61, 45p. incl. illus. table, 29 refs.
(Proj. 1366)
(ASD TR 61-107) Unclassified report

DESCRIPTORS: (*Boundary layer, Gases, Fluid mechanics, Fluid flow, Pressure, Temperature.) (Thermal diffusion, Surface properties, Friction.) (*Laminar boundary layer, Heat transfer, Friction, Supersonics, Hypersonics.)

This analysis is the groundwork for presenting boundary layer characteristics as functions of

universal parameters. The usual assumption, that the thermal and dynamic boundary layer thicknesses have negligible effect on the boundary layer characteristics, is analyzed. Compressible laminar boundary layer equations with arbitrary pressure and temperature gradients are solved for stagnation point. The solution considers the difference in thermal and dynamic boundary layer thicknesses. Computations were carried out for stagnation point flow using this analysis. The analysis shows that the difference in thermal and dynamic layers has an appreciable effect on the heat transfer paarameter and a secondary effect on the skin friction parameter and the other characteristics of the boundary layer. The analysis indicates that the effect of the difference in the thermal and dynamic layers should be considered in any analysis of the boundary layer. (Author)

AD-268 603 Div. 9, 25, 15
(TISTP/TL) OTS price $15.00

Lockheed Aircraft Corp., Sunnyvale, Calif.
RADIATIVE PROPERTIES OF HIGH TEMPERATURE GASES,
by B. H. Armstrong, D. E. Buttrey and others.
Oct 61, 1v. incl. illus. tables, 59 refs.
(Rept. no. 2-34-61-1)
(Contract AF 29(601)2774, Proj. 7811)
(AFSWC TR 61-72, vol. 1)
Unclassified report

DESCRIPTORS: (*Gases, *High temperature research, *Gas ionization, *Quantum mechanics, Ions, Density, *Continuum mechanics.) (Nitrogen, Thermodynamics, *Equations of state, Hydrogen, Oxygen, Measurement, Absorption, Theory, Temperature, Hydrodynamics, Heat.) (Probability, Photoelectric cells, Number theory, Integral equations, Inequalities, Matrix algebra.) Statistical functions.

A theory is presented to establish a rigorous basis for the computation of the number of ions in given quantum states, for a partially ionizedgas in thermal equilibrium, in the low density limit. A calculation of the line contribution to the Planck mean absorption coefficient is made for nitrogen and oxygen and a measure of its significance to the Rosseland mean absorption coefficient is derived. Line broadening theories are discussed with respect to the calculation of absorption coefficients. A tabulation is presented of Debye lengths, ion sphere radii, occupation numbers and other parameters of significance to the radiative properties of nitrogen and oxygen. Measurements were made of absolute intensity of the radiation from shock heated nitrogen and oxygen in the temperature range of 8000 to 18,000 K. The wavelength range investigated is from 3500 to 5600 A. Transition probabilities for the N(+)2 First Negative System were inferred from the measurements. (Author)

AD-268 607 Div. 9
(TISTW/EET) OTS price $3.60

National Aeronautics and Space Administration, Washington, D. C.
TRANSONIC AND SUPERSONIC FLUTTER INVESTIGATION OF 1/2-SIZE MODELS OF ALL-MOVABLE CANARD SURFACE OF AN EXPENDABLE POWERED TARGET,
by Charles L. Ruhlin and W. J. Tuovila.
10 Oct 61, 35p. incl. illus. tables, 2 refs.
(NASA Technical memo. no. SX-616)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical memo. SX-616.

DESCRIPTORS: (*Target drones, *Canard configuration, *Flutter, Transonics, Supersonics, Mach number, Model tests, Wind tunnel models.)

The experimental investigations covered a Mach number range from 0.7 to 2.55. The semispan models were tested at 0 degrees angle of attack with three pitch spring stiffnesses and with free play in pitch ranging from 0 degrees to 1 degrees. All model configurations investigated were flutter free to dynamic pressures 32 percent greater than those required for flight throughout the Mach number range. No flutter could be obtained although several model configurations were tested to considerably higher dynamic pressures. (Author)

AD-268 628 Div. 9, 12
(TISTA/LSK) OTS price $1.00

Systems Technology, Inc., Inglewood, Calif.
LINEARIZED DYNAMICS OF ROTATING AEROSPACE VEHICLES WITH INTERNAL ANGULAR MOMENTA,
by Duane T. McRuer and Julian Wolkovitch.
July 61, 22p. incl. illus. tables, 14 refs.
(Contract AF 33(616)5961, Proj. no. 8219)
(ASD TN 61-63) Unclassified report

DESCRIPTORS: (Guided missiles, Spaceships, Servo systems, Control systems.) (Linear systems, *Dynamics for Rotating structures, Airframes, Torque, Moments, Roll, Pitch, Stability, Stability (Lateral), Stability (Longitudinal), Mathematical analysis, Equations, Motion.)

The coupling of longitudinal and lateral motions arising from the gyroscopic effects of internal rotating parts, and fron inertial cross-coupling is considered. Equations of motion are reduced to a four-degrees-of-freedom set by neglecting perturbations in the rolling velocity and forward speed as measured in a special axis system. A quartic characteristic equation results which contains the effects of steady-state lateral angular and pitching velocities. This quartic can be regarded as the characteristic equation of a hypothetical closed-loop system and the roots, critical lateral angular velocity, etc., can be obtained by standard graphical servo techniques. Examples of the application of these techniques are presented to show that this approach indicates the salient features of the coupled motions, predicts any stability deficiencies that may exist, and enables the effects of parameter changes to be analyzed swiftly. (Author)

AD-268 738 Div. 9
(TISTA/LSK) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
AERODYNAMIC CHARACTERISTICS OF TOWED CONES USED AS DECELERATORS AT MACH NUMBERS FROM 1.57 TO

4.65.
by Nickolai Charczenko and John T. McShera.
Dec 61, 26p. incl. illus. tables, 9 refs.
(NASA Technical note no. D-994)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-994.

DESCRIPTORS: (Spaceships, Re-entry vehicles, *Deceleration, *Conical bodies, Towed bodies, Drag, Stability, Aerodynamics, Re-entry aerodynamics, Atmosphere entry, Supersonics, Wind tunnel models, Model tests.)

Towed and sting-supported cones were tested in the wake of various payloads at supersonic speeds to determine their drag and stability characteristics. The investigation extended over a Mach number range from 1.57 to 4.65 and included such variables as Reynolds number, cone angle, ratio of cone base diameter to payload base diameter, and trailing distance. Cones towed in the wake of a symmetrical payload at supersonic speeds, in general, had good drag and stability characteristics if towed in the supersonic flow region. A cone with an included angle between 80 and 90 degrees gave 2 maximum drag while still maintaining stability. In order to minimize wake effects, the ratio of cone base diameter to payload base diameter should be at least one and preferably around three. A trailing distance of three times the payload base diameter, in most cases, is of sufficient length to avoid low drag and instability of the decelerator. (Author)

AD-268 826 Div. 9, 12
(TISTA/SEB) OTS price $2.60

Polytechnic Inst. of Brooklyn, N. Y.
APPROXIMATE SOLUTIONS FOR AERODYNAMIC HEATING OF REENTRY VEHICLES,
by Charles J. Ruger. Nov 61, 18p. 4 refs.
(PIBAL rept. no. 729)
(Contract AF 49(638)445, Proj. 9781)
(AFOSR-1761) Unclassified report

DESCRIPTORS: (Spaceships, Re-entry vehicles, *Re-entry aerodynamics, *Aerodynamic heating, Boundary layer, Mathematical analysis, Equations, Theory.)

Aerodynamic heating of space vehicles during reentry with constant aerodynamic coefficients is considered. General relations for the conditions at the maximum heating rate, and for the total heat input at the stagnation point from entry to any point in the trajectory, are developed. The relations are not subject to the restrictions of skip or exit trajectories with entry velocity greater than the circular speed. The relation presented for the heat input has 2 parts. The first, which is the most significant part of the heat input, is of closed form. The second part is left in terms of an integral and evaluated by Simpson's rule. Only a small number of steps are required in the numerical evaluation of this integral, thus making this solution much shorter than direct numerical integration. The numerical results calculated from this solution show good agreement with those from the direct numerical integration. (Author)

AD-268 827 Div. 9
(TISTP/TL) OTS price $4.60

Polytechnic Inst. of Brooklyn, N. Y.
LINEARIZED DIFFUSION IN A RELAXING GAS,
by Pasquale M. Sforza and Martin H. Bloom.
Nov 61, 42p. incl. illus. 6 refs. (PIBAL rept. no. 736)
(Contract AF 49(638)445)
(AFOSR-1769) Unclassified report

DESCRIPTORS: (*Gases, Diffusion, *Gas flow, *Hypersonic flow, *Cylindrical bodies, *Spheres.) (Time, Pressure, Transformations, Differential equations.) (Superaerodynamics, Recombination reactions, Continuum mechanics, Fluid mechanics, Relaxation time.)

The linearized model of a gas with diffusion processes and rate reaction is applied to one-dimensional unsteady motion generated by initial non-uniformities of state and velocity. The time-dependent system resembles that of steady free mixing of jet or wake type, with two space coordinates. The time-wise character of the profiles of flow variables is studied analytically under two sets of conditions: (1) Zero mass-motion with state non-uniformity in slab-like, cylindrical and spherical configurations; this corresponds to steady flow with a non-dissipating step-function velocity profile. (2) Mass-motion with uniform temperature in slab-like configuration; this corresponds to two-dimensional viscous isothermal free mixing with thate variations of concentration and enthalpy. (Author)

AD-268 853 Div. 9
(TISTP/TL) OTS price $7.60

Cornell U. Sibley School of Mechanical Engineering, Ithaca, N. Y.
AN EXPERIMENTAL INVESTIGATION OF LIQUID DISTRIBUTION AND SURFACE CHARACTER IN HORIZONTAL ANNULAR TWO-PHASE FLOW.
Interim rept. no. 3,
by H. N. McManus, Jr. Oct 61, 22p. tables, 11 refs.
(Contract DA 30-115-ORD-992, Proj. 59901004(2117))
(AROD rept. no. 2117.4) Unclassified report

DESCRIPTORS: (*Fluid flow, *Fluid mechanics, *Gas flow, *Supersonic flow, Surface properties, *Turbulent flow, Surface tension.) (Wave analysis, Spectrographic analysis, Pressure, Theory, Test, Viscosity, Friction, Velocity, Laminar boundary layer, Density, Penetration, Sheets.)

An analysis of two-phase flow was performed. The model used considers the interfacial surface roughness and the relative velocity between the two phases. Expressions for the mean film thickness and the friction factor are obtained. Comparison of predicted film depths and friction coefficients with measured values shows agreement within the limits of the popular correlations. The agreement between theory and experiment is excellent when the experimental system approaches symmetry, a condition of the model. (Author)

AD-268 862 Div. 9, 25, 7
(TISTP/WH) OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
FLOW OF ELECTRICALLY CONDUCTING GAS IN A CHANNEL WITH A TRAVELING MAGNETIC FIELD,

by E. P. Zimin and Ye. I. Yantovskiy. 14 Dec 61, 8p. incl. illus. 3 refs. (Trans. no. FTD-TT-61-113 of Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Mekhanika i Mashinostroyeniye 4:170-172, 1961)
Unclassified report

DESCRIPTORS: (*Gas flow, Magnetic fields, *Magnetohydrodynamics, Feasibility studies, Electric power production, *Gas turbines.) (Thermal utilization, Gas flow, Magnetohydrodynamics, Gas turbines.) USSR.

The study considers problems associated with estimating the possibility of substituting for a bladed turbine a magnetogasdynamic device in which the thermal energy as it is liberated during burning is partially converted to mechanical or directly to electrical energy. Such a conversion is possible during the flow of an electrically conducting gas in a moving magnetic field. (Author)

AD-268 863 Div. 9, 25
(TISTP/WH) OTS price $2.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
NEWS OF THE ACADEMY OF SCIENCES, USSR, OFFICE OF TECHNICAL SCIENCES, MECHANICS AND MACHINE BUILDING (SELECTED ARTICLES),
14 Dec 61, 20p. incl. illus. 7 refs. (Trans. no. FTD-TT-61-112 of Izvestiya Akademii Nauk, SSSR, Otdeleniye Tekhnicheskikh Nauk, Mekhanika i Mashinostroyeniye 6:109-111, 1960)
Unclassified report

DESCRIPTORS: (*Gas flow, Fluid mechanics, Particles, Turbulence.) (Gas flow, Compressible flow, *Laminar boundary layer, Thermal radiation.) USSR.

Contents:
The stability of laminar motion of a fluid containing a heavy admixture
Calculation of the radiation flux in a laminar boundary layer

AD-268 874 Div. 9, 25
(TISTP/WH) OTS price $8.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
STUDY OF NONEQUILIBRIUM PHENOMENA IN SHOCK WAVES,
by S. A. Losev and A. T. Osipov. 11 Dec 61, 84p. incl. illus. tables, 191 refs. (Trans. no. FTD-TT-61-196 of Uspekhi Fizicheskikh Nauk 74:393-434, 1961)
Unclassified report

DESCRIPTORS: (*Shock waves, Propagation, Gases, Theory, Experimental data, Shock tubes.) (*Gas diffusion, Relaxation time, Irreversible processes.) USSR.

A survey is presented of the basic methods and the results of theoretical and experimental study of the various relaxation phenomena in shock waves. A theoretical examination of the equilibrium establishment is discussed according to individual degrees of freedom; the examination is made on the basis of the kinetic theory of gases. The experimental study of the state of the gas in shock waves is then discussed. The method using shock tubes is examined. Only endothermic processes in gases are examined. (Author)

AD-268 909 Div. 9
(TISTP/TL) OTS price $6.60

David Taylor Model Basin, Washington, D. C.
INVESTIGATION ON THE INFLUENCE OF STIFFENER SIZE ON THE BUCKLING PRESSURES OF CIRCULAR CYLINDRICAL SHELLS UNDER HYDROSTATIC PRESSURE,
by James A. Nott. Dec 61, 63p. incl. illus. tables, 18 refs. (Rept. no. 1600)
Unclassified report

DESCRIPTORS: (*Cylindrical bodies, Pressure, Measurement, Shear stresses, Stresses, Hydrostatic pressure.) (Elasticity, Plasticity, Buckling, Theory, Failure (Mechanics), *Plastics, Tests, Stability.) (*Aluminum, *Steel, Equations, Mathematical analysis.) (*Model tests, Structural shells.)

A theoretical derivation is given for elastic and plastic buckling of stiffened circular cylindrical shells under external hydrostatic pressure. The theory accounts for variable shell stresses, as influenced by the circular stiffeners, and critical buckling pressures are obtained for simple support conditions at the shell-frame junctures. Methods are given for the determination of collapse pressures for both elastic and plastic asymmetric buckling by interation and numerical minimization.

AD-268 945 Div. 9
(TISTP/TL) OTS price $1.10

Cornell U Sibley School of Mechanical Engineering, Ithaca, N. Y.
INVESTIGATION OF LIQUID DISTRIBUTION AND SURFACE CHARACTER IN HORIZONTAL ANNULAR TWO-PHASE FLOW. Final rept.,
by H. N. McManus, Jr. Oct 61, 4p.
(Contract DA 30-115-ORD-992, Proj. 59901004)
(AROD rept. no. 2117.5)
Unclassified report

DESCRIPTORS: (Fluid flow, *Fluid mechanics, Surface properties, *Pressure, Measurement, Turbulent flow, Viscosity.) (Wave analysis, Spectrographic analysis, Surface tension.) Least square method.

10. FUELS AND COMBUSTION

AD-268 386 Div. 10, 27
(TISTA/SEB) OTS price $1.60

Ballistic Research Labs., Aberdeen Proving Ground, Md.
MINUTES OF THE THIRD REVIEW OF THE ROCKET PROPELLANT SUPPORTING RESEARCH HELD AT BALLISTIC RESEARCH LABORATORIES, ABERDEEN PROVING GROUND, MARYLAND. JULY 1961.
Technical note.
July 61, 14p.
Unclassified report

DESCRIPTORS: (*Liquid rocket propellants, *Hybrid rocket propellants, *Solid rocket propellants, Synthesis, Preparation, Mechanical properties, Physical properties, Casting.) (Binders, Polymers.) (Encapsulation, Honeycomb cores.) (Combustion, Stability.) (Boron compounds, Borohydrides, Chemical reactions with Nitrogen compounds, Fluorides.) (Nitrogen compounds, Oxides, Chemical reactions.) (Gases, High temperature research, Kinetic theory, Reaction kinetics.) (Free radicals, Chemical reactions, Spectrographic analysis.)

Contents: Solid bipropellant; Hexcel encapsulation; Hypervelocity studies; Mechanical properties of solid propellants; Combustion instability; Reaction of boron hydrides with N-F compounds; High-temperature gas reaction kinetics; A shock tube technique for studying the kinetics of highly exothermic systems; Small scale rocket testing; Preparation of new propellants; Fast free radical reactions by absorption spectroscopy; Gas explosion kinetics; Reactions of nitric oxide; and Thermodynamic calculations.

AD-268 499 Div. 10
(TISTA/SEB) OTS price $4.60

TAPCO West Coast Engineering, Thompson Ramo Wooldridge, Inc., Inglewood, Calif.
INVESTIGATION OF AUTOIGNITION AND OTHER PHENOMENA IN HIGH TEMPERATURE AIRCRAFT FUEL SYSTEMS.
Final rept.,
by R. Wolfshagen, H. Edwards and others. Sep 61, 43p. incl. illus. tables.
(Contract AF 33(616)7137, Proj. 3084)
(ASD TR 61-480) Unclassified report

DESCRIPTORS: (*Jet engine fuels, Aerodynamic heating, Vapors, *Ignition.) (Jet planes, Fuel tanks, Fuel systems, Simulation.) (High temperature research, Pressure, Fuels, Mixtures, Combustion.) (Fuel tanks, Cooling by Air, Feasibility studies.) (Tests, Test equipment, Test methods, Tables, Nomographs.)

The autoignition characteristics of JP fuels were investigated using a test rig incorporating a 1 cu ft. reaction chamber simulating possible conditions in the vapor space of aircraft fuel tanks operating in high temperature environment. The autoignition phenomena was governed primarily by time, mixture temperature, mixture pressure and mixture composition. Fuel vapor will react with any percentage of available O at any pressure level provided mixture temperature is sufficiently high and accumulated time at temperature is sufficiently long to promote autoignition. Combustion, with proper mixture composition and pressure level, will result in measurable pressure rise at autoignition temperatures above approximately 435 F. The pressure rise resulting from autoignition was related primarily to mixture composition and pressure level and is reasonably predictable from the 2 parameters. Variables producing little or no effect on the incidence or type of reaction obtained included presence of a small environmental hot spot in the chamber vapor space, chamber wall temperature and material, type of diluent gas and chamber size. (Author)

AD-268 575 Div. 10
(TISTA/SEB) OTS price $3.60

Bureau of Mines, Pittsburgh, Pa.
FLAMMABILITY CHARACTERISTICS OF HIGH TEMPERATURE HYDROCARBON FUELS.
Rept. for 1 Nov 59-31 Oct 60 on Aviation Fuels,
by Joseph M. Kuchta, Alphonse Bartkowiak and others. May 61, 29p. incl. illus. tables, 5 refs.
(Contract AF 33(616)60-5, Proj. 3048)
(WADD TR 61-89) Unclassified report

DESCRIPTORS: (Hydrocarbons, *Jet engine fuels, Vapors, Ignition, Combustion, Hazards, Safety, Tests.) (Heating, Pressure, Temperature on Mixtures of Gases, Nitrogen, Oxygen, Vapors of Jet engine fuels.) (Cylindrical bodies, Stainless steel, Copper, Test equipment.)

Data are presented on the flammability and autoignition temperature characteristics of JP-6, JP-150 and HTF-59-24 fuels. Flammability limits of the vapors of these fuels were determined in air at elevated temperatures and at atmospheric pressure. Auto-ignition temperatures and corresponding ignition delay times were obtained under static and dynamic conditions as a function of the pressure and the oxygen concentration of the ambient medium; the effect of fuel volume on auto-ignition was also determined in static tests. The auto-ignition of JP-6 fuel vapor-oxygen-nitrogen mixtures was studied in various vessels which were heated uniformly and non-uniformly; critical heat flow requirements for auto-ignition were found for spherical and cylindrical Cu vessels and a spherical stainless steel vessel. (Author)

AD-268 610 Div. 10, 16
(TISTB/LH) OTS price $4.60

North American Aviation, Inc., Los Angeles, Calif.
TOXICOLOGICAL RESEARCH ON CENTRAL NERVOUS SYSTEM EFFECTS OF BORANE FUELS.
Final rept. on Health Hazards of Material and Radiation,
by C. E. Schoettlin, G. M. Cianko and others. Sep 61, 36p. incl. illus. tables.
(Contract AF 33(616)7186, Proj. 7165)
(ASD TR 61-438) Unclassified report

DESCRIPTORS: (*Rocket propellants, *Liquid rocket propellants, Boron compounds, Hydrides, *Toxicity, Man, Pathology, Electroencephalography, Experimental data.)

Accidental human exposure to boron hydrides was studied with respect to the effects on the central nervous system. Serial electroencephalographic (EEG) tracings were used to identify the effects. Results of the study indicate little or no central nervous system damage was experienced by the participants. Methods, machines, and techniques used are described in detail. A complete data summary of all subjects tested is included. (Author)

AD-268 729 Div. 10, 14, 20
(TISTM/EJH) OTS price $1.60

Naval Radiological Defense Lab., San Francisco, Calif.
EFFECT OF POTASSIUM BICARBONATE ON THE IGNITION OF CELLULOSE BY THERMAL RADIATION,
by A. Broido and S. B. Martin. 2 Oct 61, 18p. incl. illus. 8 refs. (USNRDL TR-536)
(DASA-1255) Unclassified report

DESCRIPTORS: (*Cellulose, Wood pulp, Paper, Impregnation with Potassium compounds, Bicarbonates.) (Cellulose, Ignition by Thermal radiation.) Pyrolysis, Combustion.

In accord with the established effectiveness of $KHCO_3$ as a fire extinguishing agent, it has been shown that $KHCO_3$ treatment of alpha cellulose papers prior to their exposure to thermal radiation reduces their sensitivity to transient flaming and that sustained flaming

may be completely prevented without adding more than 1.5% by weight. On the other hand, $KHCO_3$ treatment greatly increases the sensitivity of cellulose to glowing ignition, apparently by increasing the rate and degree of pyrolysis. Treatment particularly enhances the production during pyrolysis of such combustible gases as H_2, CH_4, C_2H_4, and C_2H_6 at the expense of high molecular weight, tarry materials. (Author)

AD-268 927 Div. 10
(TISTA/LSK) OTS price $8.10

Research Inst. U. of Michigan, Ann Arbor.
AN EXPERIMENTAL AND THEORETICAL STUDY OF STATIONARY GASEOUS DETONATION WAVES,
by J. A. Nicholls, E. K. Dabora and others.
Oct 61, 80p. incl. illus. 80 refs. (Rept. no. 02874-9-F)
(Contract AF 49(638)562; Continuation of Contract AF 18(600)1199)
(AFOSR-1764) Unclassified report

DESCRIPTORS: (Hydrogen, Air, Jet mixing flow, Combustion, Ignition, *Detonation waves, Shock waves, Theory, Mathematical prediction, Mathematical analysis, Measurement, Test methods, Test equipment.) (Magnetohydrodynamics, Gases, Detonation waves.) (Supersonics, Combustion.)

Emphasis was given to the study of the standing detonation wave in a hydrogen-air mixture. The experimental arrangement and procedures employed are described and the experimental results presented. A revised analysis of the ignition delay zone behind the shock is presented which handles the equations. The prediction of the time rate of growth of concentrations of the radicals behind the shock is slightly different than the earlier analysis (AD-240 064) but the prediction of ignition time delay is unchanged. Vibrational relaxation is considered as it affects the ignition time delay. Preliminary measurements aimed at probing the combustion region of the detonation wave by means of the sodium D-line reversal technique are described. A consideration of some probable 2 dimensional effects behind the shock reveal a possible explanation of uncertain anomalous ignition delay measurements. Consideration is given to the theoretical prediction of magneto-gasdynamic effects on plane gaseous detonation waves and to an attempted experimental check on the linearized theory of heat addition in a supersonic stream. (Author)

AD-268 931 Div. 10
(TISTM/REB) OTS price $2.60

Ammunition Development Div., Picatinny Arsenal, Dover, N. J.
PERFORMANCE OF IRRADIATED AND CHEMICALLY TREATED JP-5 FUEL WITH INHIBITED RED FUMING NITRIC ACID,
by S. R. Matos and E. J. Johnson. Aug 61, 21p. incl. illus. (Technical rept. no. DL-TR:1-61)
Unclassified report

Original contains color plates: all ASTIA reproductions will be in black and white. Original may be seen in ASTIA Hq.

DESCRIPTORS: (*Jet engine fuels, *Nitric acid, Radiation effects, Fuel additives, Effectiveness, *Rocket fuels, Specific impulse, Combustion.) Gamma rays.

Gamma radiated and NALCO 305 treated JP-5 were evaluated as rocket fuels with inhibited red fuming HNO_3 in a 300-lb-thrust uncooled rocket engine operated at 320 psia chamber pressure. No significant difference in performance was noted between the 2 treated fuels and the untreated JP-5 when tested under similar conditions using specific impulse as the criterion of comparison. The irradiated JP-5 was treated by immersion in a cobalt 60 gamma pool to a total radiation level of 1500 roentgens obtained at a rate of 500 roentgens/hr. Testing was performed within the half-life period of the irradiated fuel. The chemical treatment consisted of adding 0.38 ml of NALCO 305/gal of JP-5. Prior to testing, the mixture was agitated and allowed to stand for 8 hr to be certain that the additive had dispersed all the unstable fuel particles. Irradiation and chemical additives as a treatment for jet fuels was for the purpose of reducing the particle size of unstable constituents, determined to be present in the fuel by the electron microscope, to improve combustion and burning rate properties of the fuel. (Author)

AD-268 955 Div. 10, 25
(TISTM/TCG) OTS price $5.60

Aeronutronic, Newport Beach, Calif.
AN EXPERIMENTAL PROGRAM FOR OBTAINING THE THERMODYNAMIC PROPERTIES OF PROPELLANT COMBUSTION PRODUCTS.
Quarterly technical summary rept. no. 2,
by D. L. Hildenbrand and L. P. Theard. 15 Dec 61, 44p. incl. illus. tables, 34 refs. (Publication no. U-1497)
(Contract NOw 61-0905-c)
(ARPA Order no. 22-61) Unclassified report

DESCRIPTORS: (*Solid rocket propellants, Combustion, Vaporization, Vapors, *Combustion chamber gases, Sublimation, Condensation, Gas diffusion, Thermodynamics, Vapor pressure.) (*Aluminum compounds, Nitrides, Lithium compounds, Oxides, Magnesium compounds, Chlorides, Crystals.) (*Boron compounds, Oxyfluorides.) (*Zirconium compounds, Hydrochloric acid.) Mass spectroscopy, *Tin, *Gold.

The present best value for the heat of formation of gaseous BOF monomer at 298 K is -143 ± 3 kcal/mole. All temperature measurements above 1000 C are now made by observing the radiation emitted from a black body cavity in the bottom of the effusion cell. A determination of the dissociation pressure using the new arrangement yields the value -76.1 ± 2.1 kcal/mole for the heat of formation of crystalline AlN at 298 K, in good agreement with recent calorimetric values. Torsion-effusion studies of the vaporization of Li_2O indicate that the gaseous Li_2O molecule is more stable than previously believed. The vapor pressure and vapor molecular weight of crystalline $MgCl_2$ were determined from torsion-Knudsen measurements. The heat of sublimation and heat of formation of Mg_2Cl_4 (g) at 298 K were derived as 63.3 ± 2 kcal/mole and -243.5 ± 2 kcal/mole, respectively. Transpiration studies of the reaction of ZrO_2 with gaseous HCl are being made in the 900 - 1400 K range. (Author)

AD-268 985 Div. 10
(TISTM/TCG) OTS price $9.10

Aerojet-General Corp., Sacramento, Calif.
STUDY OF MECHANICAL PROPERTIES OF SOLID ROCKET PROPELLANTS.

Quarterly rept. no. 3, 29 July-29 Oct 61, by James H. Wiegand. 15 Dec 61, 93p. incl. illus. tables, 66 refs. (Rept. no. 0411-10Q-3) (Contract AF 33(600)40314)

Unclassified report

DESCRIPTORS: (*Solid rocket propellants, *Propellant grains, Binders, Polymers, Urethanes, Design, Structures, Mathematical analysis.) (Porosity, Mechanical properties, Tensile properties, Deformation, Elasticity, Stresses, Failure (Mechanics), Storage, Aging, Photoelasticity, Test methods.) (Pressure, Hydrostatic pressure.)

The strain energy of the propellant at break increases more with hydrostatic pressure than is accountable for as pressure volume work in tensile measurements. The rehealing of the oxidizer-bond following repeated strain is complete within 5 days at 110 F, but is slower and less complete at lower temperatures. Marked volume increase at 0 F with strain was observed on a Class 2 polyurethane propellant. The observed effect of void content on the bulk modulus agreed well, for small void contents, with calculations based on the pressurization of small hollow spheres. Progress in theoretical stress analysis included extension of computer techniques to shapes other than the simple tubular cylinders for the elastic case with constant Poisson's ratio. Pressurization of a noncircular configuration was performed in live propellant up to 150 psi with accompanying strain observations; progress in embedded strain gages indicates the feasibility of this method of strain measurement in motors. A detailed literature survey on tear was made and tear experiments with glass beads in binder systems were performed. An analysis of the shear and tensile forces between spheres is presented which predicts failure behavior similar to that observed. (Author)

11. GROUND TRANSPORTATION EQUIPMENT

AD-268 889 Div. 11
(TISTW/DLW) OTS price $4.60

Army Transportation Board, Fort Eustis, Va.
NODWELL CARRIER RN 110, PHASE II: DESERT EVALUATION.
Rept. of evaluation.
Jan 62, 41p. incl. illus. tables (Rept. no. TCB-61-047-EV)

Unclassified report

DESCRIPTORS: (*Cargo vehicles, *Tracked vehicles, Recovery vehicles, Desert tests, Tests.)

This evaluation was made to determine the adequacy of the Nodwell Carrier RN 110A as a logistical cargo carrier from the standpoint of operational capability over terrain considered representative of desert conditions in foreign theaters of operation. The vehicle is a highly mobile cargo carrier than can traverse difficult terrain carrying a payload of 11,000 lb. Although this vehicle was designed primarily as a cargo carrier, it also has a limited towing capability. It is steered through levers that hydraulically activate a controlled differential equipped with outer planetary reduction gears. The controlled differential can also be used for braking by activating the steering levers simultaneously. It was concluded that the vehicle, although originally designed for use in subarctic muskeg, has excellent mobility over desert terrain. The vehicles's limited speed and deficiencies make it less suitable for desert operations than present military wheeled vehicles equipped with desert tires.

12. GUIDED MISSILES

AD-268 136 Div. 12, 9
(TISTA/WAW) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
LANDING-IMPACT-DISSIPATION SYSTEMS,
by Lloyd J. Fisher, Jr. Dec 61, 25p. incl. illus. (NASA Technical note D-975)
Unclassified report

Paper presented at the NASA-Industry Apollo Technical Conference, Wash., D. C., July 18-20, 1961.

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-975.

DESCRIPTORS: (*Re-entry vehicles, *Landing, Impact shock, Absorption, Mathematical analysis, Tests, Model tests.) (Landing, Rocket motors, Pneumatic devices, Honeycomb cores, Sandwich construction, Wood, Landing gear, Airframes, Parachutes, Balloons, Ski landing gear, Hydrodynamics.)

Analytical and experimental investigations were made to determine the landing-energy-dissipation characteristics for several types of earth-landing-impact systems having application to reentry vehicles. The areas of study are divided into three velocity regions: (1) those having primarily vertical velocity, (2) those having both moderate horizontal and moderate vertical velocity, and (3) those having primarily horizontal velocity. The impact systems discussed are braking rockets, gas-filled bags, frangible metal tubing, aluminum honeycomb, balsa wood, strain straps, and both skid and skid-rocket landings on hard-surface runways and on water. (Author)

AD-268 249 Div. 12
(TISTA/SEB) OTS price $8.60

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
OPTIMIZATION OF MANNED ORBITAL SATELLITE VEHICLE DESIGN WITH RESPECT TO ARTIFICIAL GRAVITY.
Master's thesis,
by Benjamin J. Loret. Aug 61, 84p. incl. illus. 42 refs. (Rept. no. GA/Mech 61-15)
Unclassified report

DESCRIPTORS: (*Gravity, Simulation in *Satellite vehicles, Manned, Rotation, *Rotating structures, Design, Theory.) *Thesis.

A design envelope is established from a human-factors analysis of the artificial gravity environment peculiar to rotating space vehicles. The envelope is prescribed by: an upper limit on vehicle angular velocity of 0.4 radians/sec to minimize the occurrance of canal sickness; a basic upper limit on artificial gravity of one g' and a basic lower limit on artificial gravity of 0.2 g as the lowest value of g at which man can walk unaided. Both g-limits are modified to compensate for Coriolis forces which cause variation in g-level for tangential walking inside the rotating vehicle. An upper limit on vehicle radius of 180 ft is established on the basis on engineering practicality. The optimum vehicle configuration is established as a Modified Axially-Expanded Dumbbell, characterized by a single, cylindrical living-working compartment oriented parallel to the spin axis, counter-balanced by other vehicle components. The configuration is illustrated in the conceptual Pseudo-Geogravitational Vehicle, which has a radius of 180 ft and an operational angular velocity of 0.4 rad/sec to produce 0.9 g in the living-working compartment. (Author)

AD-268 281 Div. 12, 6, 25
(TISTW/RD) OTS price $2.60

Motorola, Inc., Riverside, Calif.
PULSED LIGHT INVESTIGATION.
Interim engineering rept. no. 4, Sep-Nov 61,
by William J. Nolan, Jr. Dec 61, 21p. incl. illus. (Rept. no. RLI-3854-4)
(Contract AF 33(616)7680)
Unclassified report

DESCRIPTORS: (*Light pulses, Light, Sources, Light transmission, Brightness.) (Sparks, Electric discharges in Mineral oils.) (Electrodes, Materials.) (*Photoelectric target seekers, Optical tracking, Space flight, Airborne.) (*Guided missiles, *Guidance.)

Research is continued on pulsed light. By using vinyl plastic sleeving as the wall of the spark discharge chamber, repeated discharges in oil at an energy level above 20 joules were sustained. The spark duration, as measured by its luminous output, is approximately 2 microseconds, with the particular capacitor and electrode structure used. With the higher energy level of these discharges, tungsten and other materials previously used were shattered and it was necessary to use high speed steel tool bits for electrodes. (Author)

AD-268 287 Div. 12
(TISTW/EET) OTS price $8.60

Research and Advanced Development Div., AVCO Corp., Wilmington, Mass.
AVCO MARK 5 MOD 4A RE-ENTRY VEHICLE. REVISION I. VOLUME I. HANGAR N. VOLUME II. HANGAR I AND MISSILE ASSEMBLY BUILDING. VOLUME III. MUNITIONS AND LAUNCH AREAS.
Rept. on Assembly and Test Procedures,
by R. J. Cerrato. 30 Dec 60, 1v. incl. illus.
(Rev. 1 of RAD document no. 60-1431A)
(Contract AF 04(647)258)
Unclassified report

DESCRIPTORS: (*Guided missiles, Surface-to-surface, *Hangars, *Ground support equipment.) (Containers, Handling, Storage, Shipping, Fork lift vehicles, Transportation, Maintenance personnel, Test equipment.) *Re-entry vehicles, Preparation, Test methods.

A description of the assembly procedures and test operations of the Avco Mark 5 Mod 4A Series re-entry vehicles is presented. The application of this document is restricted to the Avco Mark 5 Mod 4A Series re-entry vehicles and to related TSE/GSE necessary to implement the Re-entry Vehicle testing. The purpose is to provide a simple comprehensive approach which defines those areas which may be unfamiliar to the technician, and to prescribe routines for the accomplishment of the tasks associated with each area. (Author)

AD-268 295 Div. 12
(TISTA/SEB) OTS price $3.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
NASA/AGENA B. RELIABILITY PROGRAM DOCUMENT.
27 Apr 61, 26p. incl. illus. tables (Rept. no. SSN-T61-1; LMSD-446430)
(Contract AF 04(647)592)
Unclassified report

DESCRIPTORS: (*Satellite vehicles, *Reliability, Satellite vehicle research, Research program administration, Test methods, Tests.)

The NASA/Agena B reliability program is required to insure the reliability of the following: Agena B vehicle; Booster/Agena B separation system; Spacecraft/Agena B separation system; Spacecraft shroud ejection system; System to assure Agena lunar miss; Interface between Agena B and primary booster; and Interface between Agena B and spacecraft. (Author)

AD-268 343 Div. 12, 9
(TISTA/VGW) OTS price $2.25

National Aeronautics and Space Administration, Washington, D. C.
FLIGHT-PATH CHARACTERISTICS FOR DECELERATING FROM SUPERCIRCULAR SPEED,
by Roger W. Luidens. Dec 61, 92p. incl. illus. tables (NASA Technical note D-1091)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1091.

DESCRIPTORS: (Spaceships, Hypervelocity vehicles, Re-entry vehicles, Atmosphere entry, Re-entry aerodynamics, *Orbital flight paths for Drag, *Deceleration, Aerodynamic heating, Lift.)

Characteristics of six types of flight paths for the deceleration from circular and supercircular speeds are developed in closed form. The heating rate, heat input per square foot obtained from an integration over the flight path, the total heat vehicle, and the flight-path histories in terms of path angle, altitude, life coefficient, net acceleration, angle of attack and Reynolds number are discussed as a function of type of flight plan, initial net acceleration, and initial velocity. A flight plan with essentially a point landing capability is suggested. (Author)

AD-268 345 Div. 12, 27
(TISTA/SEB) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
ORBITAL PAYLOAD REDUCTIONS RESULTING FROM BOOSTER AND TRAJECTORY MODIFICATIONS FOR RECOVERY OF A LARGE ROCKET BOOSTER,
by Alan D. Levin and Edward J. Hopkins. Dec 61, 17p. incl. illus. tables, 5 refs. (NASA Technical note D-1143)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1143.

DESCRIPTORS: (*Satellite vehicles, Guided missile trajectories, Theory, Mathematical analysis.) (*Booster rockets, Booster rocket cases, Recovery.) (Satellite vehicles, Guided missiles, Load distribution, Theory, Mathematical analysis.)

An analysis was made to determine the reduction in payload for a 300 nautical mile orbit from the addition of inert weight, representing recovery gear, to the first-stage booster of a three-stage rocket vehicle. The values of added inert weight ranged from 0 to 18% of gross weight at lift off. The study included the effects on the payload in orbit and the distance from the launch site at burnout and at impact caused by variation in the vertical rise time before the programmed tilt. The vertical rise times ranged from 16.7 to 100% of booster burning time. For a vertical rise of 16.7% of booster burning time a 50% increase in the weight of the empty booster resulted in only a 10% reduction of the payload in orbit. For no added booster weight, increasing vertical rise time from 16.7 to 100% of booster burning time (so that the spent booster would impact in the launch area) reduced the payload by 37%. Increasing the vertical rise time from 16.7 to 50% of booster burning time resulted in about a 15% reduction in the impact distance, and for vertical rise times greater than 50% the impact distance decreased rapidly. (Author)

AD-268 363 Div. 12
(TISTW/DLW) OTS price $2.60

Army Rocket and Guided Missile Agency, Huntsville, Ala.
ESTIMATING RELIABILITY AS A FUNCTION OF STRESS/STRENGTH DATA,
by J. E. Norman. Nov 61, 18p. incl. illus. 4 ref.
Unclassified report

Presented at the NACA Sub-Committee meeting on Rocket Engines, 5 February 1958.

DESCRIPTORS: (*Guided missiles, Stresses, Failure (Mechanics), Probability, *Reliability, Mathematical analysis, Mathematical prediction.)

The mode of failure for guided weapons is shown to be by chance excess of the failure strength of some component of the assemblage rather than by wear out. An expression for the probability of such failure is developed utilizing the assumption of the normal density function for the description of the scatter of maximum stress experience and of failure strength of a component. The effect of reduction of scatter is shown, both for a single component and for a multiplicity of components. (Author)

AD-268 383 Div. 12
(TISTW/RD) OTS price $5.60

Army Rocket and Guided Missile Agency, Huntsville, Ala.
RELIABILITY OF COMPLIANCE WITH ONE-SIDED SPECIFICATION LIMITS WHEN DATA IS NORMALLY DISTRIBUTED.

Reliability rept.,
by E. L. Bombara. 15 Sep 61, 47p. incl. illus. tables, 10 refs. (Rept. no. ARGMA TR 2B1R)
Unclassified report

DESCRIPTORS: (*Guided missiles, Reliability, Statistical analysis.) (*Reliability, Specifications, Statistical distributions, Tables, Sampling, Statistical tests.)

A description is given of the theory and application of demonstrating reliability of compliance with single limits. Two statistical methods are used: the variables sampling plan method and the tolerance limit method. These methods, respectively, determine sample size and demonstrate reliability of compliance with specification limits at a prescribed confidence level. They may be applied to internal and external ballistics data of weapons systems. (Author)

AD-268 435 Div. 12
(TISTW/EET) OTS price $2.60

Illinois U., Urbana.
ANALYSIS OF MISSILE LAUNCHERS. PART J. PHASE 1 (FOUR DEGREE OF FREEDOM MULTIPLE LAUNCHER).
Technical rept. no. 188 on Dynamics of Missile Launchers,
by S. K. Lee and E. V. Wilms. Apr 61, 22p. incl. illus.
(Contract DA 11-070-508-ORD-593, Proj. 517-01-002)
Unclassified report

DESCRIPTORS: (Guided missiles, Equations of Motion for *Guided missile launchers.) (Guided missile launchers, Blast, Mathematical analysis.) (Guided missiles, Guidance, Guided missile launchers, Velocity, Acceleration, Mathematical analysis.)

An analysis of a four degree of freedom model multiple launching system is presented. The launcher pivots about a point and the motion is resisted by torsional springs. All of the missiles are parallel to one another in the launcher and are to be fired one by one in a pre-arranged order. The equations of motion of the system including the effects of blast are then established. In the second part, the effect of the blast force of the missile on the launcher face is considered. (Author)

AD-268 451 Div. 12
(TISTA/SEB) OTS price $2.60

National Aeronautics and Space Administration, Washington, D. C.
A PRELIMINARY STUDY OF THE USE OF FINITE-THRUST ENGINES FOR ABORT DURING LAUNCH OF SPACE VEHICLES,
by William A. McGowan and John M. Eggleston.
Dec 61, 23p. incl. illus. 4 refs. (NASA Technical note no. D-713)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note no. D-713.

DESCRIPTORS: (Satellite vehicles, Spaceships, Manned, Launching, Guided missile trajectories, Orbital flight paths, Failure (Mechanics).) (*Re-entry vehicles, Separation, Satellite attitude, Control systems, Rocket motors, *Retro rockets, Load distribution, Thrust, Re-entry aerodynamics, Theory, Mathematical analysis, Mathematical prediction.)

A preliminary study was made of the use of finite-thrust engines for abort during launch of space vehicles. Two example launch trajectories were considered: one characterized by relatively high flight-path angles at suborbital velocities and the other characterized by negative flight-path angles over part of the super-orbital velocity range. Aborts were initiated along the former trajectory at suborbital velocities and along the latter trajectory at super-orbital velocities. For aborts at suborbital velocities, the optimum time and direction to apply the given thrust levels were investigated from the standpoint of maximum reduction of the peak entry decelerations. For aborts at super-orbital velocity the propellant weights required to return the vehicle to earth were determined for several thrust levels and for the effects of time delay during separation and orientation. (Author)

AD-268 505 Div. 12, 15
(TISTA/VGW) OTS price $3.60

Space Technology Labs., Inc., Los Angeles, Calif.
APPLICATION OF THE RATE DIAGRAM TECHNIQUE TO THE ANALYSIS AND DESIGN OF SPACE VEHICLE ON-OFF ATTITUDE CONTROL SYSTEMS,
by H. Patapoff. 21 June 61, 32p. incl. illus.
(Rept. no. 8982-0005-RU-000)
(Contract AF 33(616)7811)
Unclassified report

DESCRIPTORS: (Spaceships, Satellite attitude, Space flight, Torque, Control, *Control systems, Mathematical analysis, Design.)

Preliminary single axis analysis and design of a space vehicle control system, consisting of a torque producing device and a dead-band within which there are no externally or internally applied torques, can be accomplished quite effectively by a simple graphical technique termed the Rate Diagram method. Two characteristics of typical space vehicle attitude control problems which make this method effective are the undamped rigid body motion of the vehicle and the associated low angular rates. The characteristics satisfy the required assumptions that the vehicle angular acceleration be proportional to the applied torque, and that system transients effectively decay prior to control torque application. The system, exclusive of the vehicle dynamics, can be of any order, thus allowing sensor dynamics, shaping networks, and control torque characteristics to be included. (Author)

AD-268 630 Div. 12
(TISTA/SEB) OTS price $8.60

Aerojet-General Corp., Azusa, Calif.
RESEARCH STUDY TO DETERMINE PROPULSION REQUIREMENTS AND SYSTEMS FOR SPACE MISSIONS. VOLUME I. SUMMARY.
Final rept., 1 Feb-31 Oct 61.
Dec 61, 1v. incl. illus. tables (Rept. no. 2150, vol. 1)
(Contract NAS 5-915)
Unclassified report

DESCRIPTORS: (*Space flight, Propulsion, Thrust, Specific impulse, Military requirements.) (Space probes, Lunar probes, Manned, Spaceships, Orbital flight paths, Satellite vehicles, Satellite vehicle trajectories, Satellite rendezvous vehicles.) (Guidance, Launching, Landings.) (Rocket propellants, Solid rocket propellants, Liquid rocket propellants, Hybrid rocket propellants, Electric propulsion, Nuclear propulsion, *Rocket propulsion.)

Mission analysis: Orbital corrections; Orbital rendezvous; Lunar and interplanetary trajectory corrections; Lunar and planetary orbiting maneuvers; Lunar and planetary landings; and Lunar and planetary takeoffs. System concepts: Chemical systems; Nuclear heat-transfer systems; Electric engine systems; Control characteristics; and Operational considerations. Mission/system classification: Propulsion requirements; System concepts; and Categorization of propulsion requirements. Objectives and approach: Lunar mission; and 24-hr satellite mission. Lunar missions: Manned circumlunar missions; Manned lunar orbiting and return missions; and Manned lunar landing and return mission. Unmanned 24-hr satellite mission: Mission requirements; and System selection and specification.

AD-268 631 Div. 12, 27
(TISTA/SEB) OTS price $17.00

Aerojet-General Corp., Azusa, Calif.
RESEARCH STUDY TO DETERMINE PROPULSION REQUIREMENTS AND SYSTEMS FOR SPACE MISSIONS. VOLUME IIa. RESEARCH STUDIES (TEXT).
Final rept., 1 Feb-31 Oct 61.
Dec 61, 1v. incl. illus. tables, 57 refs.
(Rept. no. 2150, Vol. 2a)
(Contract NAS 5-915)
Unclassified report

DESCRIPTORS: (*Space flight, Space probes, Lunar probes, Manned, Propulsion, Thrust, Specific impulse, Military requirements, Mathematical analysis, Mathematical prediction.) (Guidance for Guided missile trajectories, Flight paths, Orbital flight paths, Satellite rendezvous vehicles, Launching, Landings.) (*Rocket propulsion, Rocket propellants, Liquid rocket propellants, Solid rocket propellants, Hybrid rocket propellants, Nuclear propulsion, Electric propulsion.)

The mission-analysis section includes a study of space-propulsion requirements that are anticipated within the following general areas: Orbital corrections; Orbital rendezvous; Lunar and interplanetary trajectory corrections; Lunar and planetary orbiting maneuvers; and Lunar and Planetary landings and takeoffs. The system-concepts section presents a comprehensive review of the general characteristics of propulsion systems considered applicable to various space-propulsion requirements. The following general types of propulsion systems were considered: Liquid-propellant chemical; Solid-propellant chemical; Hybrid chemical; Nuclear heat-transfer; and Electric propulsion systems. The types are further classified according to characteristics such as propellant types, chamber-pressure range, and nozzle-cooling method. Primary emphasis was placed on liquid-propellant chemical systems. An analysis termed mission/system classification summarizes the over-all space-propulsion requirements developed by the mission analysis work. (Author)

AD-268 632 Div. 12, 27
(TISTA/SEB) OTS price $13.50

Aerojet-General Corp., Azusa, Calif.
RESEARCH STUDY TO DETERMINE PROPULSION REQUIREMENTS AND SYSTEMS FOR SPACE MISSIONS. VOLUME IIb. RESEARCH STUDIES (FIGURES AND TABLES).
Final rept., 1 Feb-31 Oct 61.
Dec 61, 180p. incl. illus. tables (Rept. no. 2150, Vol. 2b)
(Contract NAS 5-915)
Unclassified report

DESCRIPTORS: (*Space flight, Space probes, Lunar probes, Manned, Propulsion, Thrust, Specific impulse, Military requirements, Tables, Data.) (Guidance, Guided missile trajectories, Flight paths, Orbital flight paths, Satellite rendezvous vehicles, Launching, Landing.) (*Rocket propulsion, Rocket propellants, Liquid rocket propellants, Solid rocket propellants, Hybrid rocket propellants, Nuclear propulsion, Electric propulsion.)

Presentation is made of figures and tables referred to in Volume IIa (AD-268 631) of the final report which documents Phase I of the Research Study to Determine Propulsion Requirements and Systems for Space Missions. (Author)

AD-268 633 Div. 12
(TISTA/SEB) OTS price $17.50

Aerojet-General Corp., Azusa, Calif.
RESEARCH STUDY TO DETERMINE PROPULSION REQUIREMENTS AND SYSTEMS FOR SPACE MISSIONS. VOLUME IVa. APPENDIXES.
Final rept., 1 Feb-31 Oct 61.
Dec 61, 1v. incl. illus. tables, refs. (Rept. no. 2150, vol. 4a)
(Contract NAS 5-915)
Unclassified report

DESCRIPTORS: (*Space flight, Lunar probes, Space probes, Manned, Propulsion, *Rocket propulsion, Military requirements, Theory, Mathematical analysis.) (Guidance, Guided missile trajectories, Flight paths, Orbital flight paths, Velocity, Errors, Thrust, Launching, Landing.) (Spaceships, Reliability, Cooling, Design.) (Rocket propellants, Storage, Moon.)

Contents: Non-impulsive orbital maneuvers; Continuous thrust epoch-change; Two-dimensional earth orbit rendezvous; Three-dimensional considerations for midcourse corrections requirements; Analysis of initial interplanetary trajectory errors; Velocity requirements and error effects for terminal corrections; Velocity requirements and error effects for orbiting maneuver; Approximate analysis of atmospheric-grazing maneuvers; Vertical landing on Mars; Propulsion requirements for direct Mars landing - Deceleration of 8 Earth G; Thrust variability; Lunar orbiting mission with abort capability; Circumlunar trajectory analysis; Lunar trajectory computation and trajectory corrections; Simulation of Lunar orbital and landing maneuvers; Lunar hovering and horizontal translation; Derivation of optimum insulation thickness; Radiation-cooled thrust chamber weight analysis; Structural weight evaluations; Thrust level and chamber pressure optimization; Applicable concept display; Reliability analysis; and Lunar storage of propellants.

Division 12 - GUIDED MISSILES

AD-268 662 Div. 12
(TISTW/EET) OTS price $1.10

ITT Kellogg, Chicago, Ill.
FIXED GROUND COMMUNICATION SYSTEMS. WEAPONS SYSTEM 107A-2.
Program progress rept. no. 55 for Nov 61.
Nov 61, 2p.
(Contract AF 04(647)298)
Unclassified report

DESCRIPTORS: (*Guided missiles, Surface to surface, *Communication systems, Public address systems, *Intercommunication systems, Design, Tests.)

AD-268 719 Div. 12, 2, 9
(TISTA/VGW) OTS price $3.50

Ohio State U. Research Foundation, Columbus.
PRELIMINARY INVESTIGATION OF INTERPLANETARY LUNAR AND NEAR PLANET ENVIRONMENTS AND METHODS OF SIMULATION,
ed. by C. D. Jones, J. H. Shaw and others.
July 61, 216p. incl. illus. tables, refs.
(Contract AF 33(616)5914, Proj. 1309)
(ASD TR 61-267) Unclassified report

DESCRIPTORS: (*Space environmental conditions, Atmosphere of Mars, Venus, Moon.) (Simulation of Thermal radiation, Heat transfer, Cosmic rays, Solar energy, Radiation effects, Impact shock, Penetration, Erosion by Meteors, Particles, Vibration, Shock waves, Shock from Acceleration, Weightlessness, Pressure, Low pressure research, Vacuum systems, Test methods, Test equipment, Test facilities.) (Hazards to Space flight, *Spaceships, *Lunar probes, *Space probes.)

Summaries of the natural environments of Mars, Venus, the Moon and interplanetary space are presented. The primary induced environmental stresses associated with thermal radiation, cosmic atomic and subatomic radiation, meteoroid particles, vibration, shock, acceleration, and low pressure are described for operation near the above bodies including range of anticipated values and methods of simulation. Additional simulation techniques associated with temperature, heat flux and atmospheric composition are discussed. An environmental test philosophy and a summary of heat transfer characteristics of high speed vehicles are included. Important areas not covered in this report are combined induced environments associated with atmospheric entry and biological effects and nuclear reaction radiations. (Author)

AD-268 739 Div. 12, 27
(TISTA/LSK) OTS price $1.25

National Aeronautics and Space Administration, Washington, D. C.
INTERACTION OF HIGHLY UNDEREXPANDED JETS WITH SIMULATED LUNAR SURFACES,
by Leonard E. Stitt. Dec 61, 42p. incl. illus. tables, 8 refs. (NASA Technical note no. D-1095)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note no. D-1095.

DESCRIPTORS: (*Lunar probes, *Moon, Landing, Take-off, Surface properties, Simulation, Exhaust gases, Jets, Erosion, Pressure, Load distribution.) (Rocket motor nozzles, Configuration.)

Pressure distributions and erosion patterns on simulated lunar surfaces (hard and soft) and interference effects on two representative lunar vehicles (cylindrical and spherical) were obtained with cold-air jets at various descent heights and nozzle pressure ratios to 288,000. Effects of varying the nozzle area ratio and the nozzle contour were obtained. The effects of clustering nozzles, a surface discontinuity, and operation at 5 degrees inclination from vertical were briefly investigated. Pressure measurements and schlieren photographs are presented. (Author)

AD-268 768 Div. 12, 16
(TISTA/SEB) OTS price $3.50

Thompson Ramo Wooldridge, Inc., Cleveland, Ohio.
PROPELLANT-ATMOSPHERE SYSTEM STUDY.
Rept. for May 59-May 60 on Equipment for Life Support in Aerospace.
Mar 61, 222p. incl. illus. tables, 53 refs.
(Rept. no. ER-4257)
(Contract AF 33(616)6514, Proj. 6373)
(WADD TR 60-622) Unclassified report

DESCRIPTORS: (Oxygen, *Space flight, Spaceships, Space capsules, Manned, Closed cycle ecological systems, Air conditioning equipment, Space environmental conditions, Design, Theory, Mathematical analysis.) (Chemical reactions, Rocket propellants, Rocket fuels, Rocket oxidizers, Liquid rocket propellants, Cryogenics.) (Carbon dioxide, Temperature control, Humidity, Heat tolerance, Physiology.) (Fuel cells, Power supplies, Electric power production.)

Two broad aspects of using chemical energy to provide metabolic oxygen in a manned space capsule were studied: man's ecological requirements and supply of auxiliary power. The studies were restricted to chemicals used in propulsion systems with emphasis on by-products useful to man. A survey of methods for meeting environmental requirements included (a) evaluation of passive temperature control in terms of capsule size, shape, surface emissivity, orbital altitude, orientation, and internally generated power, and (b) evaluation of weight and energy requirements for supplying oxygen, dehumidifying, and removing CO2 in the cabin. The best of 40 fuels and 35 oxidizers were screened for other factors: weight of the containers, general methods for converting the energy to electric power, mechanical prime movers (their efficiencies, cycle configurations, weight, specific fuel consumption), thermionic, thermoelectric, and electrochemical conversions. The unique adaptability of the cryogenic hydrogen-oxygen fuel system was demonstrated. (Author)

AD-268 840 Div. 12, 2
(TISTA/WAW) OTS price $1.25

National Aeronautics and Space Administration, Washington, D. C.
ELEMENTS AND PARAMETERS OF THE OSCULATING ORBIT AND THEIR DERIVATIVES,
by Wilbur F. Dobson, Vearl N. Huff, and Arthur V. Zimmerman. Jan 62, 49p. incl. illus. tables, 4 refs. (NASA Technical note D-1106)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1106.

DESCRIPTORS: (Satellite vehicles, Satellite vehicle trajectories, *Orbital flight paths, *Celestial mechanics, *Space flight, Dynamics, Mathematical analysis, Perturbation theory, Equations.)

The analysis determines the time derivatives of the conic-section orbital elements in a disturbed orbit by perturbation methods. Integration of any of the several resulting systems of six first-order linear differential equations by numerical methods can be a useful tool for the solution of problems in orbital mechanics. Equations for the two-body orbit are also summarized in a convenient manner. (Author)

AD-268 867 Div. 12
(TISTA/SEB) OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
LET US TAKE A LOOK INTO THE FUTURE,
by V. Vasilyev. 4 Dec 61, 3p. (Trans. no. FTD-TT-61-254 of Trud. 59 (12231), pp. 1, 10 Mar 61)
Unclassified report

DESCRIPTORS: (*Space flights, Guided missiles, Spaceships, Launching, Liquid rocket propellants, Rocket propulsion, Electric propulsion, USSR.)

Consideration was given to how rockets of the future will fly into the unknown universe including launching of the rocket and electric propulsion systems. (Author)

AD-268 871 Div. 12, 1
(TISTA/SEB) OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio
HERALD OF THE ACADEMY OF SCIENCES OF THE USSR (SELECTED ARTICLES).
11 Dec 61, 17p. incl. illus. (Trans. no. MCL-1188/1+2 of Vestnik Akademii Nauk SSSR 10:32-36, 99-102, 1960)
Unclassified report

DESCRIPTORS: (*Moon, Geology, Geophysics, Atmosphere.) (*Space flight, Biology Physiology, Space medicine.) USSR.

A NEW STAGE OF LUNAR STUDY: A review is presented of the structural and physical characteristics of the moon. The composition and formation of the surface, possible exsistance of atmosphere, and temperature of the moon are discussed in relation to studies conducted in the USA, France, Russia and Ireland. FLIGHT OF THE SECOND COSMIC SHIP: A report is given of the press conference held on August 24, 1960, by the Presidium of the USSR Academy of Sciences. The purpose and the preliminary results of the Soviet flight of August 19, 1960 which carried experimental animals and other living organisms around the earth are discussed.

13. INSTALLATIONS AND CONSTRUCTION

AD-268 155 Div. 13, 33
(TISTE/NTM) OTS price $2.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
EFFECT OF AGGREGATE SIZE ON THERMAL SHOCK RESISTANCE.
Final rept.,
by H. Tomita and Dolores Bennett Taylor.
6 Nov 61, 26p. incl. illus. tables (Technical rept. no. 170)
(Proj. Y-F015-15-106)
Unclassified report

DESCRIPTORS: (*Runways, Landing fields, *Concrete, Pavements, Surfaces, *Thermal stresses, *Shock, Resistance, Heating, Temperature, Tests.) (Turbojet engines, Exhaust flames, Exhaust gases, Concrete, *Cements.)

This report includes:

Corporation of Economics, Industry and Research, Los Angeles, Calif.
DATA ANALYSIS FOR AGGREGATE SIZE VS HEATING STUDIES,
by Samuel H. Brooks. Nov 61, (Appendix C to NCEL Technical rept. no. 170)
(Contract N123(62583)23273A, Proj. Y-F015-15-106)

Efforts were made to determine if the size of the aggregate used in a concrete mix is a contributing factor to the explosive spalling that takes place when concrete pavement surfaces are subjected to thermal shock. In connection with the effect of turbojet engine exhaust on concrete pavements, NCEL conducted 2 studies, one on the effect of thermal shock on concrete aggregates and one on the effect of temperature rise on cement paste. A summary of the cement-paste study is given. It was found that heating caused breakdown of aggregates. By statistical analysis, it was determined that the larger aggregates had more breakdown than the smaller ones, and that the higher temperatures caused more breakdown than the lower temperatures. It was also determined that the saturated-surface-dried aggregates experienced more breakdown than the oven-dried aggregates. (Author)

AD-268 599 Div. 13
(TISTB/LH) OTS price $2.25

General Dynamics/Convair, San Diego, Calif.
DEVELOPMENT OF CRITERIA AND QUANTITATIVE PREDICTORS OF MAINTAINABILITY OF AIR FORCE EQUIPMENT.
Rept. for 1 Mar 60-1 May 61 on Human Performance in Advanced Systems,
by Tillman Schafer, Norman Benson and Howard Clausen. Sep 61, 92p. incl. illus. tables, 10 refs.
(Contract AF 33(616)6924, Proj. 7184)
(ASD TR 61-502) Unclassified report

DESCRIPTORS: (*Air force equipment, *Aircraft equipment, *Maintenance, Maintenance equipment, Maintenance personnel, Management engineering, Effectiveness, Costs.)

A technique was developed for measuring and predicting the maintainability of Air Force equipment. The criteria chosen, after analysis of the concept of maintainability, are active unsched-

uled maintenance time (the mean number of man-hours spent in actual unscheduled maintenance per maintenance action) and active unscheduled maintenance load (the mean number of man-hours spent in actual unscheduled maintenance per system operating hour). A technique was developed and predictions based on the technique were compared with skilled mechanics' estimates of the time required to perform a sample of F-106 maintenance actions. The results agreed quite well. The technique requires considerable work from systems analysts and maintenance engineers, and it does not provide many quantitative relations between the criteria and equipment characteristics. However, it promises to aid in design and technical order preparation, and it imposes no new data requirements. (Author)

AD-268 848 Div. 13
(TISTM/REB) OTS price $7.60

Illinois U., Urbana.
THE INVESTIGATION OF DEEP REINFORCED CONCRETE BEAMS UNDER STATIC AND DYNAMIC LOADING. VOL. I STRENGTH AND BEHAVIOR IN FLEXURE,
by R. E. Untrauer. July 61, 167p. incl. illus. tables, 11 refs.
(Contract AF 29(601)2372, Proj. 1080)
(AFSWC TR 61-47, vol. 1) Unclassified report

DESCRIPTORS: (*Beams, Mechanical properties, Loading, Stresses, Fracture (Mechanics), Failure (Mechanics), Deflection.) Reinforced concrete.

An investigation was made to determine the strength and behavior in flexure of reinforced concrete deep beams under slowly and rapidly applied loading, as a basis for the development of a rational and efficient design procedure. The objectives were accomplished by analyzing the results of static and dynamic tests. There were three main types of failures observed in both the static and dynamic tests: flexure, flexure-shear, and shear. The cracking patterns and modes of failure were the same for the dynamic and static companion tests. Two main types of cracks developed, vertical and inclined. The dynamic behavior is compared to the static behavior. It has been shown that the inertia forces in these tests were small and can be neglected; therefore the applied load-deflection curves could be considered as approximate resistance-deflection curves. It was found that the dynamic stiffness and the dynamic ultimate deflection were approximately equal to their static values. (Author)

AD-268 849 Div. 13
(TISTM/REB) OTS price $17.00

Illinois U., Urbana.
THE INVESTIGATION OF DEEP REINFORCED CONCRETE BEAMS UNDER STATIC AND DYNAMIC LOADING. VOL. II STRENGTH AND BEHAVIOR IN SHEAR,
by H. A. R. de Paiva. July 61, 252p. incl. illus. tables, 18 refs.
(Contract AF 29(601)2372, Proj. 1080)
(AFSWC TR 61-47, vol. 2)
Unclassified report

DESCRIPTORS: (*Beams, Mechanical properties, Loading, Shear stresses, Fracture (Mechanics), Failure (Mechanics), Deflection.) Reinforced concrete, *Web beams.

Thirty-five beams were tested, 13 statically and 22 dynamically, to determine their strength and behavior in shear; to determine if failure under a dynamic load was different from that under a static load; and to evaluate the effectiveness of web reinforcement in moderately deep beams. All beams tested, both statically and dynamically, exhibited arch action prior to failure. Three types of failures are described for both tests: flexure, shear, and flexure-shear. Web reinforcement in the beams tested both ways contributed little toward an increase in strength or a change in behavior and mode of failure, except for generally reducing the ultimate deflections. The static strength at flexural yielding in these moderately deep beams could be predicted reasonably well by the conventional straight line theory. The ultimate static flexural strength could be predicted by the standard ultimate strength procedure provided an increased value of the limiting concrete strain equal to 0.008 is used at failure. (Author)

14. MATERIALS (NON-METALLIC)

AD-268 250 Div. 14, 25
(TISTM/GEC) OTS price $5.60

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
EFFECTS OF FINE REFRACTORY DISPERSION ON THE COMPRESSIVE STRENGTH OF A GLASSY-BONDED CERAMIC MATERIAL.
Master's thesis,
by Joseph J. Dusbabek. Aug 61, 49p. incl. illus. tables, 11 refs. (Rept. no. GAW/Mech 61-4)
Unclassified report

DESCRIPTORS: (*Ceramic materials, Refractory materials, Glass, *Silicates, *Silicon compounds, *Boron compounds, *Oxides, Crystals, High temperature research.) (Preparation, Processing, Mechanical properties, Phase studies, Microstructure, Impact shock, X-ray diffraction analysis, Microphotography, Metallurgical analysis, Physical properties, Electrical properties.)

The effects of a submicron precipitate, B70, on the compressive strength of a Si-B-O ceramic material were determined. The quantity of the submicron precipitate was increased in increments of 25% by substitution of amorphous B for crystalline B in a Si + 35 wt-% B model ceramic system. The average compressive strength increased from 195,740 psi for 100% crystalline B to 234,240 psi for 100% amorphous B. The increase in the compressive strength was attributed to a change of the internal stresses and impediment of crack propagation resulting from the introduction of the submicron precipitate, B70, into the borosilicate matrix. (Author)

AD-268 252 Div. 14, 4
(TISTM/EJH) OTS price $1.60

Harris Research Labs., Washington, D. C.
ACCELERATED DETERIORATION OF TEXTILES.
Bimonthly progress rept. no. 4, 1 Oct-30 Nov 61, by Charles A. Rader and Anthony M. Schwartz. 15 Dec 61, 8p. illus. tables, 4 refs.
(Contract DA 18-108-cml-6606)
Unclassified report

DESCRIPTORS: (*Textiles, *Plastics, Cellulose, *Cotton textiles, Radiation damage, Radiation effects, Light, Deterioration, Catalysis.) (*Photochemistry, Photochemical reactions, Photolysis, Light, Absorption, *Catalysts, Ions, Iron, Cerium, Uranyl radicals, Complex ions, Sulfonates.) (*Test methods, Mechanical properties, Failure (Mechanics), Polymerization, Carboxylic acids, Free radicals.)

The amounts of light absorbed by untreated cellophane and by cellophane containing 0.2% ferric ion were determined between wave length of 3600 to 6000 Angstroms. Highest absorbances, by treated and untreated cellophane, occurred at 3600 Angstroms; the treated cellophane absorbed 26% of the light incident upon it and the untreated cellophane absorbed 12% of the incident light. Degradation of the cellophane was measured as loss in breaking strength and also as reduction in degree of polymerization. The treated cellophane was degraded more than the untreated where samples were exposed for the same length of time. It was found that the carboxyl content of untreated cellophane was increased from 2.4 X 10 to the -5th power mole per gram to 6.6 X 10 to the -5th power mole per gram by 150 hr exposure in the Fadeometer. Work was continued using degradation accelerators other than ferric ion on cotton. Two combinations of catalysts were also tested on cotton. These were: ferric ion plus ceric ion and ferric ion plus ferrocene. (Author)

AD-268 261 Div. 14, 4
(TISTM/EJH) OTS price $1.60

Naugatuck Chemical Div., United States Rubber Co., Conn.
SYNTHESIS OF REGULATED STRUCTURE POLYPHENYLETHER-SILOXANE ELASTOMERS.
Quarterly progress rept. no. 1, 1 July-30 Sep 61, by P. L. Merz. 30 Sep 61, 12p. illus.
(Contract DA 19-020-ORD-5507)
Unclassified report

DESCRIPTORS: (*Elastomers, *Heat resistant polymers, *Vulcanizates, High temperature research, Stability, Elasticity, Synthesis, Polymerization.) (Hydroxides, Polymers, Phenyl radicals, Ethers, Copolymerization, Silanes, Silicones, Vulcanization.) (Chemical reactions, Hydrolysis.)

Synthesis of polyphenylether-siloxane elastomers involves 3 separate phases: (1) synthesis of p,p'-dihydroxypolyphenylether blocks; (2) Condensation of these with silane groups to yield high molecular weight block copolymers; and (3) Development of suitable vulcanizing systems for these block copolymers. This report deals with phase 1. Guided by the findings of our literature survey, 2 methods of preparing the first member of the dihydroxypolyphenylether series were investigated. The first method, the alkaline fusion of the alkali salts of the commercially available oxy-bis-(p-benzene sulfonate) was unsuccessful. The second method, the synthesis and subsequent hydrolysis of 4,4'-dibromodiphenylether has thus far, given only low yields of the desired 4,4-dihydroxydiphenylether. It is believed, however, that this hydrolysis reaction can be developed into a practical synthesis. (Author)

AD-268 262 Div. 14 13
(TISTM/EJH) OTS price $1.25

Naval Civil Engineering Lab., Port Hueneme, Calif.
EFFECT OF TEMPERATURE RISE ON COMPRESSIVE STRENGTH OF HARDENED CEMENT PASTE.
Final rept.,
by H. Tomita and D. E. Well. 22 Nov 61, 46p. incl. illus. tables, 2 refs. (Technical rept. no. 169)
(Proj. Y-F015-15-107)
Unclassified report

DESCRIPTORS: (*Cements, *Concrete, *Pavements, Runways, Landing fields, High temperature research, Aging, Heating, Thermal stresses, Mechanical properties, Tests, High pressure research, Failure (Mechanics), Mathematical analysis.) (Turbojet engines, Exhaust gases.) (Calcium compounds, Aluminates.)

This report includes:
DATA ANALYSIS FOR THE RATE OF HEATING CEMENT PASTE,
by Samuel H. Brooks. Nov 61, (Appendix C to NCEL Technical rept. no. 169)
(Contract N123(62583)23273A, Proj. Y-F01-15-107)

The effect of temperature rise on cement paste and the effect of thermal shock on concrete aggregates are discussed. Heating decreased the compressive strength of cement paste cubes. Higher heating rates produced no appreciable effect on the level of compressive strength or on the rate of decrease in strength with increase in maximum temperature. In general, heated calcium aluminate cement cubes yielded a lower compressive strength than the heated portland cement cubes. A 57-day curing and drying period increased compressive strength with respect to maximum-temperatures. It appears preferable to have the cement paste and aggregates as dry as possible before the concrete is subjected to high thermal-shock.

AD-268 266 Div. 14
(TISTM/TCG) OTS price $1.00

Plastics Technical Evaluation Center, Picatinny Arsenal, Dover, N. J.
INDEXED REFERENCES PERTAINING TO DEGRADATION AND FRACTURE OF PLASTICS,
by Arnold E. Molzon. Aug 61, 36p. 210 refs.
(PLASTEC note no. 2)
Unclassified report

DESCRIPTORS: (*Bibliography on *Plastics, Laminates, Glass textiles, Resins, Polymers.) (Deformation, Deterioration, Fracture (Mechanics), Crazing, Stresses, Tensile properties, Radiation damage.)

A literature search was conducted for articles pertaining to the degradation and fracture of plastics. References on relatively slow degradation processes such as weathering were minimized. Some references on the effects of nuclear radiation were included. Two hundred and ten selected references were listed and cross indexed in terms of materials and subject. The materials index identifies those references which pertain to a specific type or class of plastic material (polystyrene, glass reinforced laminates, etc.). The subject index identifies those references relating to a specific subject (degradation, failure mechanism, fracture, stress cracking, etc.). This literature search and related work such as the evaluation of references and the compilation of data are continuing. (Author)

AD-268 429 Div. 14, 26
(TISTM/EJH) OTS price $1.10

General Electric Co., Cincinnati, Ohio.
HIGH STRENGTH GLASS FIBERS DEVELOPMENT PROGRAM.
Monthly progress rept. no. 4, 15 Oct-15 Nov 61, by D. L. Hollinger and H. T. Plant. 25 Nov 61, 5p. illus.
(Contract NOw 61-0641-c)
Unclassified report

DESCRIPTORS: (*Filament wound construction, Fibers, *Synthetic fibers, *Glass textiles, Glass, Resins, Coatings, Mechanical properties.) (Manufacturing methods, Processing, Melting, Laboratory furnaces, (Drawing (Machine processing).) Rocket cases.

Equipment check out and refinement accounted for most effort during the past month. The spooler was run successfully at speeds to 1800 rpm. This corresponds to a linear drawing speed of 5600 fpm. This machine serves both to draw the glass filament and later to provide a controlled speed rewinding of the resin-coated filament into test rings. (Author)

AD-268 480 Div. 14, 26, 27
(TISTM/EJH) OTS price $1.10

Rocketdyne, Canoga Park, Calif.
PREIMPREGNATED ROVING STUDY.
Monthly progress rept. no. 8, 1-30 Nov 61. 15 Dec 61, 9p. incl. illus. (Rept. no. 61RC17856)
(Contract NOw 61-0498-c)
Unclassified report

DESCRIPTORS: (*Rocket cases, *Propellant tanks, Cylindrical bodies, *Filament wound construction, Wire winding machines.) (Fibers, *Synthetic fibers, Glass textiles, Impregnation, Resins, Epoxy resins, Laminates.) (Mechanical properties, Tensile properties, Aging, Temperature, Pressure, Hydrostatic pressure, Tests, Processing.)

Preliminary data are presented on the effect of tension, resin content, and mandrel diameter on resin migration. Studies of aging, the effect of storing preimpregnated roving at deep-freeze temperature, and the effect of various process parameters, were completed. No degradation of the impregnated roving stored at deep-freeze temperatures took place. Studies of the combined effects of roving resin content and tension, as they effect resin migration, showed migration increases with tension and is greater on smaller diameter mandrels. It is apparent that as the size of the mandrel increases, resin migration is effected less by changes in tension. No significant relationship was apparent between resin content in the roving and the percent of resin migration.

AD-268 612 Div. 14, 26
(TISTM/TCG) OTS price $5.60

Narmco Industries, Inc., San Diego, Calif.
POTENTIAL OF FILAMENT WOUND COMPOSITES.
Monthly progress rept. no. 9, 1-30 Nov 61, by B. Duft, C. E. Thompson and others. Nov 61, 50p. incl. illus. tables.
(Contract NOw 61-0623-c)
Unclassified report

DESCRIPTORS: (*Beams, *Filament wound construction, *Reinforcing materials, Glass textiles, Resins, Epoxy resins, Plastics, Laminates, Fibers, Coatings, Bonding, Theory.) (Tensile properties, Stresses, Shear stresses, Fracture (Mechanics), Humidity, Photoelasticity, Deformation.) (Coatings, Complex compounds, Chromium compounds, Silanes.)

A study on the effect of coupling agents, with and without coatings, on the tensile strength of E glass fiber was conducted. The fibers were tested before and after water immersion of 1 and 7 days. Tests of coated fibers subjected to elevated temperatures were conducted. A preliminary evaluation of the single discontinuous fiber tensile tests previously reported was completed. Indications are that mechanisms of failure can be predicted reasonably well for this case, provided material properties are known. A comparison of the test data with developed theory is presented and shows good correlation. Test data for continuous parallel fibers, discontinuous parallel fibers, and parallel fibers, one continuous and the other discontinuous, are presented. Stress distribution by photoelastic measurement as well as stress plots along the fiber are also included. Indications are that theoretical predictions agree well with experimental results. Studies of the fractured surfaces of these specimens were made. Photomicrographs of these failures are presented which show interesting fracture phenomena. (Author)

AD-268 629 Div. 14, 4
(TISTM/GEC) OTS price $1.25

Southern Research Inst., Birmingham, Ala.
DEVELOPMENT OF A PERMANENTLY FIRE-RESISTANT COTTON FABRIC BY REACTION WITH ORGANOBORON COMPOUNDS.
Rept. for 1 Feb 60-29 Mar 61 on Fibrous Materials for Decelerators and Structures, by R. Winston Liggett and George Bosmajian. June 61, 32p. incl. tables, 36 refs.
(Contract AF 33(616)6941, Proj. 7320)
(ASD TR 61-6) Unclassified report

DESCRIPTORS: (*Fire resistant textiles, *Cotton textiles, *Organoboranes, Polymers, Heat resistant polymers, Halides, Acids, Esters.) (Amines, Boric acids, Urea.) (Diboranes, Phosphites, Phosphines, Amino acids.) (Epoxides, Isocyanic acids, Chemical reactions, Preparation.) Azoles.

An evaluation of 50 organoboron compounds as durable, flame-resistant finishes for cotton fabric, was made. Some were effective for imparting initial flame resistance, but none produced flame-resistant effects that would withstand even mild laundering. Approximately 100 preparations of organoboron compounds were carried out. Treatments were applied to 4 forms of the cotton fabric: as essentially pure cellulose, as alkali cellulose, as aminocellulose, and as cellulose-amine complexes. The ranges of organoboron compounds and of cellulose modifications made it possible to explore the hydrolytic stability of a variety of types of chemical and physical linkages as well as the effects of various side groups. In no case were any flame-resistant or washfast effects observed that would indicate any advantage of the organoboron compounds over the ordinary boric acid-boric oxide mixtures. (Author)

AD-268 769 Div. 14, 30
(TISTM/TCG) OTS price $3.60

Textile Research Inst., Princeton, N. J.
THERMAL CHARACTERISTICS OF COATED TEXTILE FABRICS.
Summary rept. no. 1 (Progress rept. no. 4) 1 July 59-1 July 60,
by Robert F. Schwenker, Jr. and Louis R. Beck, Jr. 30 Nov 61, 32p. incl. illus. tables, 34 refs.
(Contract N140(138)67979B)
Unclassified report

DESCRIPTORS: (*Textiles, Synthetic fibers, Fibers, *Cotton textiles, *Cellulose, *Acrylic resins, *Nylon, *Orlon, Coatings, *Rubber coatings, Elastomers, High temperature research, Decomposition.) Test methods, Pyrolysis, Gravimetric analysis, Chromatographic analysis, Test equipment.

Information on the application of differential thermal analysis (DTA) to studies on the thermal behavior of textile fabrics and coatings is discussed. Effects of important experimental variables on the DTA curves are described; new data on cellulosic and acrylic fibers is presented. A survey of techniques and instrumentation in the area of dynamic thermogravimetric analysis is discussed. Work on the pyrolytic degradation of cotton, nylon, Neoprene W, butyl rubber, Hypalon-20 and fabric-coating combinations is presented. Some pyrolyzates were analyzed by paper chromatography and classical organic techniques. The pyrolysis data obtained gave corraborative evidence for the chemical nature of all fabric-coating interactions between cotton and nylon and the three elastomers used as coatings. (Author)

AD-268 850 Div. 14, 25
(TISTM/REB) OTS price $2.60

Raytheon Co., Waltham, Mass.
MICROWAVE LOSSES IN STRONTIUM TITANATE ABOVE THE PHASE TRANSITION.
Scientific rept. no. 1 on Investigation of the Microwave Properties of Ferroelectrics,
by G. Rupprecht and R. O. Bell. Nov 61, 15p. illus. 15 refs. (Rept. no. S-357)
(Contracts AF 19(604)8005 and DA 36-039-sc-89126)
(AFCRL-962) Unclassified report

DESCRIPTORS: (*Strontium compounds, *Titanates, Dielectric properties, Electromagnetic properties, Microwaves, Ferroelectricity.) (Chemical impurities, Gadolinium, Iron.) (Mixtures, *Barium compounds and Strontium compounds, Titanates.) (Ferroelectric materials, Phase transitions.)

The microwave losses in both pure and doped $SrTiO_3$ have been investigated as a function of frequency and temperature. The loss tangent is proportional to frequency in the range 3 - 36 kMc. Above the phase transition at 110 K, the temperature dependence of the loss tangent is well represented by tan delta equals 1/T-T sub c (alpha + beta T + gamma (sq T)), where the Curie temperature, T sub c equals 37 K. The parameter alpha is shown to be determined by lattice imperfections and vanishes for pure single crystalline material. The parameters beta and gamma are intrinsic properties of the perfect lattice and are essentially unaffected by imperfections. It is suggested that beta and gamma are related to third and fourth order anharmonicity terms in the interionic potential. (Author)

AD-268 938 Div. 14, 30
(TISTM/TCG) OTS price $1.00

National Carbon Co., Parma, Ohio.
RESEARCH AND DEVELOPMENT ON ADVANCED GRAPHITE MATERIALS. VOL. I. OBSERVATIONS BY ELECTRON MICROSCOPY OF DISLOCATIONS IN GRAPHITE.
Rept. for 1 May 60-28 Feb 61 on Refractory Inorganic Non-Metallic Materials,
by Richard Sprague. Sep 61, 26p. incl. illus.
(Contract AF 33(616)6915, Proj. nos. 7350, 7381 and 7-817)
(WADD TR 61-72, vol. 1)
Unclassified report

DESCRIPTORS: (*Graphite, *Single crystals, Deformation, Lattices, *Grains (Metallurgy), Effectiveness, Test methods, *Electron microscopy, Microphotography.)

This report describes the application of the electron microscope to the study of dislocations in graphite. Sample preparation is detailed. Photographs illustrate the wide variety of dislocation patterns observed and some of the information obtained from them is discussed. (Author)

AD-268 976 Div. 14
(TISTM/REB) OTS price $1.10

Boeing Co., Wichita, Kans.
A286 ALLOY CERAMIC COATED.
Summary rept. no. 3.
1 Jan 62, 8p. incl. illus. tables (Rept. no. 3-88)
(Contract AF 33(616)8141, Proj. 1(8-7381))
Unclassified report

DESCRIPTORS: (Exhaust systems, *Ceramic coatings, Bonding, Oxidation, Heat treatment, Maintenance, Effectiveness, Abrasion.) Steel, Coatings, High temperature research, Airplane engines.

Attempts were made to determine the feasibility of using a ceramic coating to extend the service life of Engine Exhaust Assembly 25-12080. Experimental work showed that A-286 can be enameled satisfactorily using standard porcelain enamel techniques. Tests on the fired coatings consisting of bond, oxidation resistance, heat treating after enameling, abrasion, and field repair techniques for chipped areas revealed the ability of the ceramic coatings to perform satisfactorily under simulated service conditions. (Author)

15. MATHEMATICS

AD-268 122 Div. 15
(TISTP/MFA) OTS price $2.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
PARTIAL DIFFERENTIAL EQUATIONS: FIRST-ORDER THEORY IN ONE DEPENDENT VARIABLE--DETERMINISTIC

CASE,
by Peter L. Falb. 27 Nov 61, 24p. incl. illus. 3 refs. (Rept. no. 22G-3)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: (Mathematical analysis, *Partial differential equations, *Scheduling, Transformations (Mathematics), Functions, Linear systems.)

The basic theory of first-order partial differential equations in one dependent variable is developed from a differential geometric point of view. This point of view is such that it holds promise for use in the stochastic case and in control theory. (Author)

AD-268 139 Div. 15
(TISTP/MFA) OTS price $1.50

National Aeronautics and Space Administration, Washington, D. C.
FOURIER SERIES OPERATING PACKAGE,
by Milton L. Charnow. Dec 61, 55p. incl. illus. tables (NASA Technical note D-1078)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1078.

DESCRIPTORS: (*Fourier analysis, Series, Partial differential equations, Integration.) (Computers, *Programming.)

A computer program is presented for multiplying, adding, differentiating, integrating, barring and scalarly multiplying literal Fourier series as such, and for extracting the coefficients of specified terms. (Author)

AD-268 145 Div. 15, 20
(TISTP/TL) OTS price $5.60

Naval Weapons Evaluation Facility, Albuquerque, N. Mex.
AN EMPIRICAL STUDY OF THREE STOCHASTIC APPROXIMATION TECHNIQUES APPLICABLE TO SENSITIVITY TESTING,
by Patrick L. Odell. 15 Aug 61, 47p. incl. illus. tables, 9 refs.
(NAVWEPS rept. no. 7837) Unclassified report

DESCRIPTORS: (*Statistical processes, *Numerical methods and procedures, Nuclear weapons, Vulnerability.) (Data, Sampling, Gamma rays, Density.) (Sequences, Mathematical logic, Probability, Algebra, Functions, Metamathematics.)

The rates of convergence of three stochastic approximation estimators are studied empirically using a Monte Carlo sampling procedure. The results are presented in tabular form and various conclusions are made as to the utility of each estimator in the light of these results. (Author)

AD-268 151 Div. 15
(TISTP/TL) OTS price $3.60

Institute of Statistics, North Carolina State Coll., Raleigh.
ON NECESSARY AND SUFFICIENT CONDITIONS FOR THE CONVERGENCE OF THE RENEWAL DENSITY,
by Walter L. Smith. Aug 61, 35p. 11 refs.
(Mimeograph series no. 305)
(Contract Nonr-85509)
Unclassified report

DESCRIPTORS: (*Probability, *Statistical analysis, Functions, Integral transforms, Density, Dams, Theory.) (Geometry, Series, Inequalities, Number theory, Integrals, Integral equations, Algebra.)

AD-268 152 Div. 15
(TISTP/GRW) OTS price $1.10

Institute of Statistics, North Carolina State Coll., Raleigh.
A NOTE ON CHARACTERISTIC FUNCTIONS WHICH VANISH IDENTICALLY IN AN INTERVAL,
by Walter L. Smith. Sep 61, 5p. 2 refs.
(Mimeograph series no. 306)
(Contract Nonr-85509)
Unclassified report

DESCRIPTORS: (*Probability, *Statistical functions, Theory.)

AD-268 153 Div. 15
(TISTP/GRW) OTS price $8.10

Institute of Statistics, North Carolina State Coll., Raleigh.
A COMPARISON OF SEQUENTIAL TESTS FOR THE POISSON PARAMETER,
by Kozo Fukushima. Sep 61, 77p. incl. illus. tables, 12 refs. (Mimeograph series no. 307)
(Contract Nonr-85509)
Unclassified report

DESCRIPTORS: (*Statistical tests, *Sequential analysis, Probability, Statistical distributions, Sampling, Statistical analysis.)

The investigation treats a truncated sequential test for testing a simple hypothesis against a simple alternative. Attention is confined to the case of sampling from a Poisson population. Several test procedures are presented and compared. The test procedures are: (1) the sequential probability ratio test, both untruncated and truncated; (2) the minimum probability ratio test; and (3) the most powerful fixed sample size test. (Author)

AD-268 154 Div. 15
(TISTP/GRW) OTS price $2.60

Institute of Statistics, North Carolina State Coll., Raleigh.
SOME SEQUENTIAL ANALOGS OF STEIN'S TWO-STAGE TEST,
by William Jackson Hall. Sep 61, 21p. incl. illus. tables, 10 refs. (Mimeograph series no. 308)
(Contract Nonr-85509)
Unclassified report

DESCRIPTORS: (*Statistical tests, *Sequential analysis, Sampling, Probability.)

Several sequential analogs of Stein's two-stage test procedure are presented for testing hypotheses about the mean of a normal population with unknown variance and with specified error probabilities. When sequential experimentation is feasible, they provide alternatives to the sequential normal test (variance known) or the sequential t-test. If the variance is assumed known, the procedures may still be recommended since the added cost may be only a very few additional observations on the average, and the performance of the tests does not depend on the validity of any assumption about the variance. Unlike the t-test, these procedures do not require that the alternative hypothesis be specified in standard deviation units. (Author)

AD-268 167 Div. 15
(TISTP/GRW) OTS price $1.10

Lincoln Lab., Mass. Inst. of Tech., Lexington.
LEGENDRE SEQUENCES,
by Neal Zierler. 2 May 58, 4p. (Group rept. no. 34-71)
(Contract AF 19(122)458)
Unclassified report

DESCRIPTORS: (*Sequences, Complex numbers, *Integral transforms, Theory.)

A study is presented of a family of sequences with flat autocorrelation (assume a constant value) which essentially coincide with their Fourier transforms. The sequences also satisfy the practical requirement that they take on only two or three values.

AD-268 212 Div. 15
(TISTP/MFA) OTS price $6.60

Applied Mathematics and Statistics Lab., Stanford U., Calif.
REGULARITY OF FUNDAMENTAL SOLUTIONS OF HYPERBOLIC EQUATIONS,
by Avner Friedman. 3 Nov 61, 66p. 17 refs. (Technical rept. no. 101)
(Contract Nonr-22511, Proj. NR-041-086; In cooperation with Minnesota U., Minneapolis, Contract Nonr-71016, Proj. NR 044 004)
Unclassified report

DESCRIPTORS: *Partial differential equations, Polynomials, Operators (Mathematics), Functions, Transformations (Mathematics).

A study is made of the method of Babitch for solving the Cauchy problem for hyperbolic equations with variable coefficients, of any order. In the case of analytic coefficients, the fundamental solution is presented as a series of functions, each term being determined by the previous ones by solving fairly simple differential systems. Convergence of the series is proved by employing the method of majorants of Cauchy. (Author)

AD-268 213 Div. 15
(TISTP/GW) OTS price $3.60

Applied Mathematics and Statistics Lab., Stanford U., Calif.
AN ISOPERIMETRIC EQUALITY, AND RELATED QUESTIONS,
by Robert Finn. 14 Nov 61, 32p. 6 refs. (Technical rept. no. 102)
(Contract Nonr-22511, Proj. NR-041-086)
Unclassified report

DESCRIPTORS: *Conformal mapping, Algebra, *Differential geometry, Theory.

Let S be a piece of smooth two-dimensional surface. If circles of radius r on the surface are defined with respect to global conformal parameters on S, then an estimate of the ratio of the square of the length of the circle to the area of the circle is shown to be true for every complete simply-connected open surface on which the curvature is absolutely integrable. If certain smoothness hypotheses are satisfied by S at infinity, then these circles become, up to terms of negligible order, curves which are equidistant from a fixed point on S. In this sense, the image of a large circle in a plane on which S is represented conformally will be a circle on S. As corollaries of the method, asymptotic estimates for the lengths of the images of circles and of radial lines in such a reference plane are given, depending only on the curvatura integra. (Author)

AD-268 269 Div. 15, 30
(TISTP/WH) OTS price $3.60

RIAS, Inc., Baltimore, Md.
A GEOMETRIC INTERPRETATION OF PONTRJAGIN'S MAXIMUM PRINCIPLE,
by Emilio Roxin. Dec 61, 28p. illus. 11 refs. (Technical rept. no. 61-15)
(Contracts AF 49(638)382 and DA 36-034-ORD-3514)
(AFOSR-1751) Unclassified report

DESCRIPTORS: (*Control, *Control systems.) (Differential equations, Analytic geometry, Vector analysis.)

In connection with problems of control mechanisms, there have been studied systems of differential equations in which some more or less arbitrary control functions appear. An important question is how to choose those control functions to minimize (or maximize) a certain functional of the solution. Physically speaking, this may mean to operate the system in the best possible way, minimizing a cost function or simply the time of operation. Pontrjagin and his collaborators (Izvestia Akad. Nauk. SSSR, Ser. Mat 24:3-24, 1960) pointed out a general principle (the maximum principle), which applies. The problem of what can be accomplished by adequate election of the control function, disregarding the optimization problem, was studied independently by Kalman (Boletin Soc. Mat. Mexicana pp. 102-119, 1960) and the author (Boletin Soc. Mat. Mexicana, pp. 125-135). In this analysis these problems are considered from a geometrical point of view; the aim is to show interesting relations which remain hidden in a more analytical treatment, like that of Pontrjagin, Boltyanskii and Gamkrelidze. (Author)

AD-268 335 Div. 15
(TISTP/MFA) OTS price $3.60

Miami U., Coral Gables, Fla.
INTERPOLATION BY HARMONIC POLYNOMIALS,
by J. H. Curtiss. 1 Dec 61, 34p. 20 refs.
(Contract AF 49(638)862)
(AFOSR 1737) Unclassified report

DESCRIPTORS: (*Harmonic analysis, *Polynomials, Functions, Partial differential equations, Potential theory, Green's function.)

Let Hn(u; z) denote the harmonic polynomial of degree at most n found by interpolation in 2n +1 points to a function u given on the boundary C of a region D of the complex z-plane. It is proved that (a) for any bounded D there always exist interpolation points on C so that Hn can be uniquely determined for each n, and (b) for a wide class of Jordan regions D and for boundary data u with a smooth first derivative on C the points of interpolation on C can be chosen so that lim as n approaches infinity Hn(u; z) exists, z epsilon C + D, and gives the solution of the Dirichlet problem for u and D. Explicit formulas are derived for Hn in the case of interpolation on a circle and on an ellipse, and convergence is proved in these cases for arbitrary continuous boundary data. Various generalizations are indicated. (Author)

AD-268 336 Div. 15
(TISTP/MFA) OTS price $2.60

Miami U., Coral Gables, Fla.
LIMITS AND BOUNDS FOR DIVIDED DIFFERENCES ON A JORDAN CURVE IN THE COMPLEX DOMAIN,
by J. H. Curtiss. 16 Oct 61, 24p. 9 refs.
(Contract AF 49(638)862)
(AFOSR 1091) Unclassified report

DESCRIPTORS: (*Mathematical logic, *Algebras, Partial differential equations, Integrals, Integration, Polynomials, Functions.)

Let Sn+1 be a set of n+1 points lying on a Jordan curve C, let f be a function given on C, and let dn denote the divided difference of order n formed for f in the points Sn+1. It is proved that if the (n-1)-th derivative of f exists and satisfies a Lipschitz condition, and C satisfies a mild smoothness restriction, then /dn/ is uniformly bounded for all choices of Sn+1 in which the points are distinct. An extension to confluent points is given. In the case in which C is the unit circle, the structure of the bound is displayed. It is also shown for a general C that if the points of the sequence S2, S3, ... become everywhere dense on C in a certain way, then lim as n approaches infinity cn+1dn equals integral C f dz / 2pi i, where c is the transfinite diameter of C. (Author)

AD-268 407 Div. 15
(TISTP/MFA) OTS price $4.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
AN ANALYSIS OF MARKETS WITH A LARGE NUMBER OF PARTICIPANTS,
by Herbert Scarf. 20 Oct 61, 42p. 12 refs.
(Technical rept. no. 29)
(Contract Nonr-22528, Proj. NR-047-019)
Unclassified report

DESCRIPTORS: (*Games theory, Economics, Economic conditions, Analysis, Management engineering.) (Groups (Mathematics), Number theory, Probability.)

The analysis of markets is carried out using the techniques and the point of view of n-person game theory. Markets are examined as n-person games with the specific assumption of transferable utility and making use of several of the available concepts of solution of an n-person game. One of these concepts, the core, (due to Gillies) corresponds very closely to what Edgeworth and subsequent economists mean by the contract surface. (Author)

AD-268 472 Div. 15, 32
(TISTP/MFA) OTS price $3.60

Princeton U., N. J.
THE BARGAINING SET FOR COOPERATIVE GAMES.
Rept. on Econometric Research Program,
by Robert J. Aumann and Michael Maschler.
6 Nov 61, 35p. tables, 7 refs. (Research memo. no. 34)
(In cooperation with Hebrew U. (Israel))
Unclassified report

DESCRIPTORS: (*Games theory, Functions, Linear systems, *Combinatorial analysis, Alegbra, *Economics.)

AD-268 572 Div. 15, 30
(TISTP/MFA) OTS price $1.60

Boeing Scientific Research Labs., Seattle, Wash.
PROCEDURES FOR GENERATING NORMAL RANDOM VARIABLES, II,
by G. Marsaglia. Nov 61, 13p. incl. illus. table, 5 refs. (Mathematical note no. 243; Document no. D1-82-0141)
Unclassified report

Also available from Author.

DESCRIPTORS: (*Digital computers, Numerical analysis, *Coding, Programming, Probability, *Complex variables.)

A method for generating a normal random variable in terms of uniform random variables is described. The method is based on representing a density function as a mixture of simpler densities. It is fast and requires little storage (60 constants). It is not quite as fast as other methods, but it is simpler, with less chance for prospective users being set adrift in a sea of details. (Author)

AD-268 598 Div. 15, 30
(TISTP/TL) OTS price $3.00

Harvard U., Cambridge, Mass.
NOTES ON MODULAR NUMBER SYSTEMS.
Rept. for Dec 59-Dec 60 on Automatic Computation Techniques.
Sep 61, 254p. incl. illus. tables, refs.
(Contract AF 33(616)6903, Proj. 7062)
(ASD TR 61-12) Unclassified report

DESCRIPTORS: (*Digital computers, Number theory, Machines, Design, Sequential analysis.) (Mathematical logic, Probability, Automation, Machine translation, Sequences.) (Matrix algebra, Functions, Analog systems, Polynomials, *Coding, Circuits, Electrical networks, Tables.) (Computers, Digital computers, Feasibility studies, Coding, *Programming.)

The possibilities of modular number systems and their applicability to the design of digital

computing machinery were investigated. In modular number systems, the carry process is eliminated so that addition and multiplication operations can be completed in a single computer clock pulse time. Other mathematical operations, such as division, round-off, and number magnitude determination are much more complex to execute and generate problems not encountered in ordered number systems. The report consists of sixty-six independent research notes each of which is a theorem, concept, algorithm development, or similar mathematical tool in modular number system techniques. (Author)

AD-268 641 Div. 15
(TISTP/TL) OTS price $5.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
THE GENERAL THEORY OF STOCHASTIC POPULATION PROCESSES,
by J. E. Moyal. 14 Sep 61, 53p. 17 refs.
(Technical rept. no. 41)
(Contract Nonr-22521, Proj. NR 042-993)
Unclassified report

DESCRIPTORS: (*Statistical processes, Theory, *Probability.) (Complex variables, Functions, Differential equations, Partial differential equations, Integration, Functional analysis.)

Contents:
Point processes
Counting processes
Generating functionals
Stochastic population processes
Sigma-finite population processes
Cluster process
Markov population processes
Multiplicative population processes

AD-268 670 Div. 15
(TISTP/TL) OTS price $2.60

Chicago U., Ill.
NORMAL SEQUENCES AND TWISTED TENSOR PRODUCTS: APPLICATIONS TO THE STEENROD ALGEBRA.
Preliminary rept.,
by Arunas Liulevicius. 1961, 25p. incl. tables, 11 refs.
(Contract DA 11-022-ORD-2911, Proj. TB2-0001 (2160))
(AROD rept. no. 2160.10) Unclassified report

DESCRIPTORS: (*Sequences, *Algebraic topology, Algebras, Statistical distributions, Differential equations, Spheres, Groups (Mathematics).) Tables.

AD-268 676 Div. 15
(TISTP/MFA) OTS price $2.60

Michigan U. Coll. of Literature, Science, and the Arts, Ann Arbor.
TURING-MACHINES AND THE ENTSCHEIDUNGSPROBLEM,
by J. Richard Buchi. Dec 61, 25p. 20 refs.
(Rept. no. 03105-22-T)
(Contract Nonr-122421)
Unclassified report

DESCRIPTORS: (*Mathematical logic, *Machines, Machine translation, Language.) (*Memory devices, Magnetic tape, Lattices, Color centers.) (Matrix algebra, Algebras, Transformations (Mathematics).)

A discussion of decision theory by use of Turing-machines is presented and is determined to be closelyrelated to the quantification theory. Postulates are stated and application of sentence structure is examined by use of recursive logic methods.

AD-268 754 Div. 15
(TISTP/MFA) OTS price $1.60

Research Triangle Inst., Durham, N. C.
THE CONSTRUCTION AND ANALYSIS OF NON-ORTHOGONAL PLANS FOR THE 2^n FACTORIAL EXPERIMENTS,
by Sidney Addelman. 5 Dec 61, 10p. incl. tables, 1 ref. (Technical rept. no. 8)
(Contract DA 91-009-ORD-816, Proj. 2579)
(AROD-2579:8) Unclassified report

DESCRIPTORS: (*Factor analysis, Information theory, Statistical analysis, Sampling, Matrix algebra.)

There are many situations in which an experimenter must estimate the important effects of a symmetrical factorial experiment with as few trials as possible. There are instances where, say, all two-factor interactions are important and the orthogonal plan necessary to estimate these parameters requires more trials than one can afford. If the experimenter is restricted to orthogonal fractional replicate plans he must either abandon the investigation or lose information on some of the interactions that may be important. The development of non-orthogonal plans by factor analysis is discussed. (Author)

AD-268 887 Div. 15
(TISTP/WH) OTS price $9.10

Applied Mathematics and Statistics Labs., Stanford U., Calif.
APPLICATIONS OF SHEAF THEORY TO FUNCTION ALGEBRAS,
by Albert E. Hurd. 27 Sep 61, 99p. 38 refs.
(Technical rept. no. 20)
(Contract DA 04-200-ORD-704)
(AROD rept. no. 1323:22) Unclassified report

DESCRIPTORS: (*Algebras, Functions, *Complex variables, Algebraic topology.)

A representation theory is developed for an arbitrary commutative algebra with identity in terms of al algebra of continuous functions on a suitable topological space. A brief survey is presented of the theory of coherent analytic sheaves. No attempt at completeness is made; the object being to collect in one place the definitions and results. The sheaf-theoretic results are then used to investigate algebras of holomorphic functions on the special class of complex manifolds, the Stein manifolds. A simple example is presented to point out the error of a theorem stating that the functions on the maximal ideal space of a Banach algebra, which came from elements of the algebra via the Gelfand respresentation, enjoy a certain local characterization, much as do analytic functions on a complex manifold, or continuous functions on a topological space. The appendix contains a proof of the generalization of the Stone-Weierstrass theorem. (Author)

16. MEDICAL SCIENCES

AD-268 185 Div. 16, 28
(TISTB/LH) OTS price $1.25

University of Southern Calif. School of Medicine, Los Angeles.
THE EFFECTS OF TRANSVERSE ACCELERATIONS AND EXPONENTIAL TIME-LAG CONSTANTS ON COMPENSATORY TRACKING PERFORMANCE.
Rept. on Biophysics of Flight,
by Richard C. Kashler. Sep 61, 34p. incl. illus. tables, 29 refs.
(Contract AF 33(616)5407, Proj. 7222)
(ASD TR 61-457) Unclassified report

DESCRIPTORS: (*Acceleration tolerance, Stress (Physiology), Man, *Recording devices, Human engineering.) (Pitch, Roll, Reaction time, Measurement, Analysis of variance, Errors.)

A study was conducted to determine the effects and interactions of front-to-back transverse accelerations, in the magnitudes of 0, 3 g, and 6 g, and exponential time-lag constants of 0.1, 1.0 and 2.0 seconds on human control performance on a compensatory tracking task. In general, the results substantiated predictions of human tracking performance based on Helson's U-hypothesis and Principle of Generality. Concepts from information theory are introduced to explain certain learning phenomena which occurred in the course of the experiment. (Author)

AD-268 216 Div. 16
(TISTB/LH) OTS price $.50

Army Chemical Research and Development Labs., Army Chemical Center, Md.
THE RESPONSES OF ANIMALS INHALING NITROGEN DIOXIDE FOR SINGLE, SHORT-TERM EXPOSURES.
Rept. on Health Hazards of Materials and Radiation,
by Theophilus R. Carson, Mitchell J. Rosenholtz, and Frank T. Wilinski. Oct 61, 11p. incl. illus. tables, 18 refs.
(Proj. no. 7165)
(ASD TR 61-525) Unclassified report

DESCRIPTORS: (*Nitrogen compounds, Dioxides, *Toxicity, Laboratory animals, Dosage, Experimental data, Pathology, Physiology.)

These experiments were designed to study the effects of NO(2) at various concentration levels below the LC50 (Lethal Concentration 50) for single, short-exposure periods to obtain concentration causing minimal effects to animals. Rats and rabbits were exposed to various concentrations of NO(2) for 5 to 60 minutes and the LC50's calculated. In addition, rats and dogs were exposed for single 5- to 60-minute periods to various concentrations of NO(2) below the rat LC50's. Toxic signs, pathologic changes in the lung and lung-to-body weight ratios correlated directly with the severity of exposure to NO(2). Dogs showed only mild toxic signs at concentrations causing pulmonary edema in rats. Based on lung-to-body weight ratios and pathologic changes found, the concentrations of NO(2) at which minimal effects were found were 104, 65, and 28 ppm for 5, 15, and 60 minutes, respectively. (Author)

AD-268 226 Div. 16
(TISTB/CCH) OTS price $1.10

School of Aerospace Medicine, Brooks Air Force Base, Tex.
INFLUENCE OF ALTITUDE CHANGES ON INTESTINAL IRON ABSORPTION,
by Cesar Reynafarje and Jose Ramos. Sep 61, 7p. incl. illus. tables (Rept. no. 61-107)
(In cooperation with Andean Inst. of Biology (Peru))
Unclassified report

DESCRIPTORS: (*Iron, Absorption, Intestine, *Metabolism, High altitude.) (*Polycythemia, Blood, Erythrocytes.)

The absorption of iron in the form of ferrous sulfate was studied in 82 subjects and under various conditions of altitude exposure. Intestinal absorption of iron increased during the first days of exposure to an altitude of 14,900 feet and reached a maximum at the end of a week. It was less marked 4 weeks later. Iron absorption decreased in natives of high altitude brought down to sea level, reached a minimum in 3 weeks, and then returned to normal within 16 months. Studies on the recovery of iron in feces confirmed the changes that were interpreted on the basis of the amount of iron appearing in the red blood cells plus the iron that presumably reached the circulating plasma but was not used in red cell formation. The possible significance of failure in some cases to recover a small fraction of the total iron that was administered is discussed. (Author)

AD-268 264 Div. 16
(TISTB/LH) OTS price $.75

Pennsylvania U. School of Medicine, Philadelphia.
THERMAL REGULATORY RESPONSES OF UNANESTHETIZED DOGS DURING HYPOTHALAMIC TEMPERATURE MEASUREMENT AND STIMULATION.
Rept. for Jan 60-June 61, on Physiology Research,
by Harold T. Hammel, Harald T. Andersen and others. Sep 61, 20p. incl. illus. 20 refs.
(Contract AF 33(616)6306, Proj. 7163)
(ASD TR 61-489) Unclassified report

DESCRIPTORS: (*Hypothalamus, Skin, *Body temperature, Control and Measurement in Laboratory animals, Dogs.) (Metabolism, Respiration, Shivering, Fevers, Motor reactions, Simulation, Measurement.)

The role of the hypothalamic and skin temperatures in controlling thermal response of a resting dog was studied by two methods: (1) measurements were made of hypothalamic, rectal, ear skin, and trunk skin temperatures of the dog in winter fur in hot, neutral, and cold environments; respiration rate and shivering were observed: (2) a thermal clamp (six thermodes surrounding the hypothalamus and perfused with water to hold it at approximately 38.7 C) was used to measure thermal and metabolic responses of the resting, fasting dog during exposure to a wide range of temperatures. Although skin and hypothalamic and skin temperatures and the motor responses could not be established. (Author)

AD-268 376 Div. 16
(TISTB/LH) OTS price $2.60

School of Aerospace Medicine, Brooks Air Force Base, Tex.
PRODUCTION OF GAS IN HUMAN TISSUES AT LOW PRESSURES.
by Charles L. Wilson. Aug 61, 25p. incl. illus. tables, 75 refs. (Rept. no. 61-105)
Unclassified report

DESCRIPTORS: (Hands, *Tissues (Biology), *Gases, Decompression, *Low pressure research.) (Medical research, Experimental data.)

The development of a gas phase in human tissues was studied by exposing the left hand of each of 6 volunteer subjects to a total pressure of 49 mm. Hg or less. A gas pocket which developed in the hands of 4 of the subjects was clearly discernible by visual inspection and an appropriate roentgenographic technic. The gas pocket developed at chamber pressures less than 26 mm. Hg (23.2 km.) on initial exposure and disappeared at a chamber pressure greater than 226 mm. Hg (9.2 km.). The swelling was never painful, always disappeared promptly on repressurization of the chamber, and has never caused any apparent temporary or permanent injury to the hand. Subsequent exposure of the hand to a low total pressure caused swelling at 70 mm. Hg or more. Carbon dioxide and water vapor are believed to be the main gases involved in the phenomenon. A satisfactory plethysmograph was developed and used in this research project in studying the change in volume of the human hand at extreme chamber pressures. (Author)

AD-268 408 Div. 16
(TISTB/LH) OTS price $6.60

Air Force Missile Development Center, Holloman Air Force Base, N. Mex.
A LABORATORY MODEL FOR A FOURTEEN DAY ORBITAL FLIGHT WITH A CHIMPANZEE,
by Frederick H. Rohles, Jr., Herbert H. Reynolds and others. Oct 61, 55p. incl. illus. tables, 4 refs. (Rept. no. AFMDC TR 61-33)
(Proj. no. 6893)
Unclassified report

DESCRIPTORS: (*Space medicine, Simulation, Laboratory animals *Primates, Physiology, Psychology, Psychomotor tests.)

A young male chimpanzee was restrained on a plastic couch and isolated from the usual laboratory distractions for 14 days. Assuming a 90 minute orbit, the subject performed a complex psychomotor task for approximately nine hours each day and received all of his food and water as rewards for his performance. Skin temperature, pulse, and respiration were monitored throughout the test and urine and feces were collected outside the isolation cubicle and measured. The subject lost no weight for the test period and recovery was rapid. (Author)

AD-268 437 Div. 16, 4
(TISTM/TCG) OTS price $1.10

Oregon U., Eugene.
INVESTIGATION OF CALABASH CURARE.
Final rept., 15 Sep 60-14 Sep 61,
by V. Boekelheide. 14 Sep 61, 6p. incl. illus. 1 ref.
(Contract DA-CML-18-108-61-G-5)
Unclassified report

DESCRIPTORS: (*Curare, *Alkaloids, Deuterated compounds, Molecular structure, Physiology, Synthesis, Nuclear magnetic resonance.)

A study was made of the important alkaloid structures of calabash curare. Attempts will be made to correlate structure and physiological activity. The structures of the dihydrotoxiferine and c-curarine-I families were established. Deuterodihydrotoxiferine and deuterotoxiferine were synthesized. The study of calebassine and its associated alkaloids and lumi-dihydrotoxiferine is still under investigation.

AD-268 509 Div. 16
(TISTB/CCH) OTS price $4.60

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
SPACE FLIGHT ECOLOGIES,
by J. J. Konikoff. Dec 61, 42p. incl. illus. tables, 16 refs. (Rept. no. R61SD200)
Unclassified report

DESCRIPTORS: (*Space flight, *Ecology, *Closed-cycle ecological systems, Space environmental conditions for Man, Algae.) Air, Purification, Oxygen, Water, Recovery, Food, Temperature, Pressure, Biochemistry.

Two systems for the support of human life in sealed space vehicles are discussed with respect to air purification, oxygen recovery, water recovery, and food supply. The partially closed ecology is composed of subsystems shown by experiment to be feasible. Known chemical reactions are utilized. A completely closed ecological system that maintains a balance between man and algal culture requires considerable research and development. (Author)

AD-268 549 Div. 16, 20
(TISTB/LH) OTS price $1.10

School of Aerospace Medicine, Brooks Air Force Base, Tex.
POTENTIATION BY PENTOBARBITAL OF THE PROTECTIVE EFFECT OF AET AGAINST GAMMA RAYS,
by George S. Melville, Jr. and Thomas P. Leffingwell. Oct 61, 7p. incl. illus. tables, 25 refs. (Rept. no. 61-87)
Unclassified report

DESCRIPTORS: (*Radioprotective drugs, Barbituates, Gamma rays, Radiation effects.) (Laboratory animals, Dose rate, Effectiveness, Experimental data.)

Female rats were treated with the radioprotective drug S,beta-aminoethylisothiuronium dibromide (AET) in combination with pentobarbital sodium and irradiated with various dosages of gamma rays. This treatment appears to depend less on dose rate of radiation than does AET given alone; it also reduces the amount of AET which must be used to achieve a given degree of protection. The combination is more effective than either compound given singly. The results of this study support further the hypothesis that chemical agents with different modes of action may be successfully combined to achieve better radioprotection. (Author)

AD-268 604 Div. 16, 8
(TISTB/CCH) OTS price $3.60

Keio U. School of Medicine, Tokyo (Japan).
RELATION BETWEEN THE ELECTRORETINOGRAM (ERG) AND SINGLE CELL ACTIVITIES IN THE RETINA.
Final rept., 22 Apr 60-21 Oct 61,
by Tsuneo Tomita. 21 Oct 61, 28p. incl. illus. 27 refs.
(Grant MG1-60-1)
Unclassified report

DESCRIPTORS: (*Retina, *Electrodes, *Electrolytes (Physiology), Electronic equipment, Vision, Eye, Oscilloscopes, Experimental data.)

By means of minute micropipettes with the tip diameter less than 0.1 micron, it became possible to record intracellularly the responses

of single neutrons in the frog's retina. The Group-I responses which are obtained from the most superficial retinal layer comprise impulses of either on-, off-, or on/off-type, but are accompanied by no discerned slow potential change. The Group-II responses, which arise from a layer lying some 70 to 80 micron deeper than the depth at which the Group-I responses are recorded, also comprise impulse discharges similar to the Group-I responses, but they are featured by superimposition of the impulses on conspicuous slow potential changes resembling the ERG or some components of it. No impulses are detectable beyond the depth at which the Group-II responses are recorded, but there exists a layer from which a sustained negative potential is obtained in response to illumination (Group-III). The origin of the Group-I responses was identified to be single optic nerve fibers. The Group-III response is considered to be of the same nature as the S-potential which was first observed by Svaetichin in the fish retina. (Author)

AD-268 605 Div. 16, 30
(TISTB/CCH) OTS price $3.60

Keio U. School of Medicine, Tokyo (Japan).
BIOLOGICAL AND IMMUNOLOGICAL STUDIES ON TOXOPLASMA.
Rept. no. 1 (Final) 1 Oct 60-30 Sep 61,
by Hisakichi Matsubayashi. 30 Sep 61, 32p. incl. illus. tables, 6 refs.
(Contract DA 92-557-FEC-31899)
Unclassified report

DESCRIPTORS: (*Toxoplasma, *Immunology, *Scientific research, *Medical research, Protozoa, Parasites, Therapy, Sulfonamides, Viability, Transplantation.) Japan.

A high virulent strain of Toxoplasma which usually does not produce cysts developed chronic infection in mice resulting in the production of cysts by the treatment of sulfa-drug. A low virulent strain which usually develops chronic infection and produces cysts became to have a high virulence by the serial transplantations of the proliferative forms appearing in the peritoneal cavity in the early part of the infection. Morphologically, cyst is produced by the accumulation in some substance on the inner surface of the limiting membrane of the vacuole in which the parasite is located. Along with the multiplication of the parasite by binary fission within the vacuole, the cystic membrane becomes much thicker and ultimately a homogeneous membrane encircling numerous parasites develops. High virulent strain does not produce cysts. This is probably due to the rapid prolefiration of the parasite: the vacuole containing the parasites will burst by the rapid expansion of the volume of the parasites before the definite cystic membrane is produced. (Author)

AD-268 613 Div. 16
(TISTB/CCH) OTS price $2.60

Sasaki Foundation Medical Institution, Kanda (Japan).
STUDIES ON THE CHROMOSOMAL DIFFERENCES AMONG VARIOUS ASCITES HEPATOMAS OF RATS.
Final rept. no. 2, 15 Oct 60-14 Oct 61,
by Tomizo Yoshida. 14 Oct 61, 18p. incl. illus. tables, 2 refs.
(Contract DA 92-557-FEC-31980)
Unclassified report

DESCRIPTORS: (*Chromosomes, *Ascites in Rats, Laboratory animals.) (*Tumors, *Cells (Biology), Measurement.) (Genetics, Japan.)

The ascites hepatoma, prepared by ascitic conversion of the aminoazodye-induced hepatoma of the rat, can provide a series of ascitic tumors for comparative studies on a variety of tumors of a common normal ancestral cell, the liver cell. In 9 different transplant strains of the ascites hepatoma, the chromosome was studied with special respects to the mode of chromosome number and chromosome morphology and compared with each other. Significant differences were noted in the modal chromosome number and fluctuation range of chromosome number as well as chromosome features. This may mean that each tumor, originating from a common normal ancestral cell, has its own chromosomal pattern. (Author)

AD-268 621 Div. 16
(TISTB/LH) OTS price $17.00

Rucker Co., Oakland, Calif.
DESIGN STUDY FOR AN ACCELERATION RESEARCH DEVICE.
Rept. for 1 July 60-20 Jan 61 on Biophysics of Flight,
by Kingsley C. Drone. Aug 61, 256p. incl. illus., refs.
(Contract AF 33(616)7536, Proj. 7222)
(ASD TR 61-425) Unclassified report

DESCRIPTORS: (*Centrifuges, Design, Configuration, Theory, Acceleration tolerance, Simulation.)

Starting with the presently recognized requirements of accelerations, levels of various exposure conditions, and combinations of stresses in aerospace systems, a design study was made of an acceleration research device which would simulate these conditions. It was required that this accelerator use proven construction methods and be economically feasible. In simulating the various performance requirements there were certain areas that were quite significant in the over-all design: (1) Power requirement during the first second of maximum centrifuge onset is approximately 86,000 horsepower and necessitates a stored energy means to keep electrical power requirements below 20,000 horsepower; (2) Gyroscopic actions plus simulated vibration conditions at the end of the centrifuge arm dictate that major attention be given to arm natural frequencies and dampening qualities; (3) Resultant acceleration effects plus cab inertias necessitated some reduction in cab RPM's and onset rates to keep torque and horsepower requirements within feasibility limits; and (4) Coriolis forces must be considered in both the effect upon the subject being tested and cab structure. (Author)

AD-268 624 Div. 16
(TISTB/JAB) OTS price $4.60

Royal Hospital for Sick Children (Gt. Brit.).
STUDIES ON THE POST TRAUMATIC PATIENT. SODIUM BALANCE STUDIES, NITROGEN UTILISATION, FAT ABSORPTION, SERUM PROTEINS.
Annual technical status rept., 1 Nov 60-31 Oct 61.
1 Nov 61, 42p. incl. illus. tables.
(Contract DA 91-591-EUC-1636)
Unclassified report

DESCRIPTORS: (*Burns, Therapy, Diet, Metabolism, Body weight, Sodium, Nitrogen, Potassium, Fats, Blood proteins.)

AD-268 642 Div. 16
(TISTB/CCH) OTS price $1.60

Jewish Hospital, St. Louis, Mo.
EFFECT OF FLUID AND BLOOD ADMINISTRATION ON SURVIVAL OF THE ORGANISM SUBJECT TO VARIOUS TYPES OF HYPOVOLEMIC SHOCK.
Progress rept., 1 Jan-31 Dec 61,
by Morton D. Pareira. 31 Dec 61, 9p., 3 refs.
(Contract DA 49-007-md-799)
Unclassified report

DESCRIPTORS: (Fluids, Blood transfusions, *Hypotension, *Survival, *Therapy, Laboratory animals, Experimental data.) (Blood pressure, *Plasma volume, *Traumatic shock.)

Using refrigerator-stored tourniquet convalescent rat plasma collected under sterile conditions, there was a suggestion of improvement in early (24 hour) survival results after an otherwise lethal tourniquet trauma when compared with therapy using normal rat plasma. Forty-eight hour survival was not significantly different between groups. No difference in early or late survival is demonstrated after tourniquet trauma using slow frozen rat plasma, whether convalescent or normal, collected under non-sterile conditions. Freshly reconstituted human plasma is strikingly effective in the therapy of tourniquet trauma in the rat at a level of 3 milliliters plasma per 100 grams body weight. Human plasma, whether reconstituted or fresh, if then frozen loses this striking therapeutic effect at the same level of infusion. Fast frozen rat plasma (acetone and dry ice) is less efficacious than slowly frozen rat plasma. Both are less effective than freshly reconstituted human plasma. (Author)

AD-268 653 Div. 16
(TISTB/CCH) OTS price $2.60

Alabama U. School of Dentistry, Birmingham.
ANTIMICROBIAL SUBSTANCES IN SALIVA AND ORAL TISSUES.
Progress rept. 1 Jan-31 Dec 61,
by Frederick W. Kraus. 31 Dec 61, 12p. tables, 3 refs.
(Contract DA 49-007-md-449)
Unclassified report

DESCRIPTORS: (*Hemaggluttins of *Oral bacteria in Saliva and Mouth, Tissue (Biology).) *Antibodies, Laboratory animals, Experimental data.

Hemagglutinins and bacterial agglutinins to indigenous and pathogenic bacteria were titrated in serum and saliva of several subjects. Serum titers were uniform and moderately high, salivary titers were low and irregularly distributed among subjects. Many antibodes were non-specific, common. Finer details of antigenic relations were elucidated by animal experiment. Rabbits injected withbacteria either indigenous or pathogenic to man produced hemagglutinins all of which were common, whereas among agglutinins those which corresponded to the injected antigens were specific. Common agglutinins and precipitins, both different from the common hemagglutinins, were also produced. (Author)

AD-268 669 Div. 16
(TISTB/LH) OTS price $5.60

Biotechnology Lab., U. of Calif., Los Angeles.
ARM PROSTHESIS RESEARCH. HUMAN THERMAL STUDIES. HUMAN TRACKING.
Progress rept. for period ending 15 Sep 61,
by John Lyman. 15 Sep 61, 53p. incl. illus. table (Engineering rept. no. 61-76)
(Contracts V1005M-2075, AF 33(616)6763 and N123(60530)23558A)
Unclassified report

DESCRIPTORS: (*Prosthetics, Artificial limbs, Electromechanical converters.) (*Heat tolerance, Physiology.) (*Tracking, Behavior, Television display systems, Test methods, Psychomotor tests.)

AD-268 783 Div. 16
(TISTB/LH) OTS price $1.00

Midwest Research Inst., Kansas City, Mo.
TOLERANCE CRITERIA FOR CONTINUOUS INHALATION EXPOSURE TO TOXIC MATERIAL. I. EFFECTS ON ANIMALS OF 90-DAY EXPOSURE TO PHENOL, CCl4, AND A MIXTURE OF I INDOLE, SKATOLE, H2S, AND METHYL MERCAPTAN.
Rept. for 1 Mar-30 Nov 60, on Health Hazards of Materials and Radiation,
by Curtis Sandage. Oct 61, 31p. incl. illus. tables, 25 refs.
(Contract AF 33(616)7055, Proj. 7165)
(ASD TR 61-519, Vol. 1)
Unclassified report

DESCRIPTORS: (*Chemicals, Poisonous gases, *Toxicity, Laboratory animals, Dose rate, Pathology.) (Carbon tetrachloride, Phenols, Indoles, Hydrogen compounds, Sulfides, Thiols.) (Industry, Hazards.)

Physiological changes in rats, mice, and monkeys were studied during continuous 90-day exposure to controlled atmospheres of toxic vapors and gases. Concentrations of test chemicals were those recognized as Industrial Threshold Limit Values (TLV) and included: (a) CCl4 (25 ppm), (b) phenol (5 ppm), and (c) a mixture of indole (10 ppm), skatole (3 ppm), H2S (20 ppm), and methyl mercaptan (50 ppm). Clinical laboratory and terminal stress tests were followed by autopsy with gross and microscopic pathology. The mortality rates from toxic effects were surprisingly low, and were not in accord with prediction based on reputable toxicological theory. (Author)

AD-268 791 Div. 16
(TISTB/LH) OTS price $2.60

Naval School of Aviation Medicine, Pensacola, Fla.
SYMPTOMATOLOGY DURING PROLONGED EXPOSURE IN A CONSTANTLY ROTATING ENVIRONMENT ATA VELOCITY OF ONE REVOLUTION PER MINUTE,
by Robert S. Kennedy and Ashton Graybiel.
8 Sep 61, 19p. incl. tables, 5 refs. (Rept. no. 62)
(Proj. MR005.13-6001; NASA Grant no. R-1)
Unclassified report

DESCRIPTORS: (*Space medicine, Man, *Acceleration tolerance, Stress (Physiology), Stimulation, *Motion sickness, Rotation.)

Eight subjects were systematically observed on certain tasks aboard the Pensacola Slow Rotation Room at a velocity of one RPM. Pilot experiments indicated the great majority of unselected subjects would be symptom free at this speed.

Consequently, four subjects were selected whose susceptibility to canal sickness andmotion sickness was far above average. The findings warranted the conclusion that under the conditions of this experiment, exposure to a constantly rotating environment on one RPM does not handicap the performance of persons with far greater than average susceptibility to canal sickness.

AD-268 793 Div. 16, 28
(TISTB/MS) OTS price $2.60

Naval School of Aviation Medicine, Pensacola, Fla.
THE APPEARANCE OF COMPENSATORY NYSTAGMUS IN HUMAN SUBJECTS AS A CONDITIONED RESPONSE DURING ADAPTATION TO A CONTINUOUSLY ROTATING ENVIRONMENT,
by F. E. Guedry, Jr., and A. Graybiel.
16 Aug 61, 23p. incl. illus. table, 35 refs.
(Rept. no. 61)
(Proj. no. MR005.13-6001; NASA Grant no. R-1)
Unclassified report

DESCRIPTORS: (*Eye, *Rotation, *Conditioned reflex, *Acceleration tolerance, Tests, Stress (Physiology).)

Seven men lived in a rotating room (5.4 RPM) for 64 hours. Controlled tests before and during this interval demonstrated that Coriolis vestibular phenomena including Coriolis nystagmus diminished markedly. A compensatory nystagmus, induced by head or whole body movements, was recorded more than one hour after the rotation had ceased. Factors of possible significance in conditioning the compensatory nystagmus are: (1) otolith and proprioceptor sensory influx prior to and during discordant canal input; (2) a consistent sensory influx for each stimulus-producing movement; (3) intention in stimulus-producing movements; and (4) visual inhibition. Contributions of compensatory and arousal factors to vestibular suppression are considered in relation to practical problems of transfer of habituation from one acceleration environment to another. (Author)

AD-268 794 Div. 16, 14
(TISTB/CCH) OTS price $1.10

School of Aerospace Medicine, Brooks Air Force Base, Tex.
PREVENTION OF INITIAL HEMORRHAGE FROM SYNTHETIC VASCULAR PROSTHESES,
by John B. Fitzgerald, William G. Malette and Elmer V. Dahl. Sep 61, 5p. incl. illus. table, 14 refs. (Rept. no. 62-12)
Unclassified report

DESCRIPTORS: (*Prosthetics, *Arteries, *Hemmorrhage, Countermeasures, Rubber coatings, Synthetic rubber, Silicones.) (Blood vessels, Materials, Plastics, Dacron.)

Segments of abdominal aorta in 25 dogs were replaced by knitted Dacron prostheses in studies concerned with limiting the blood loss which ordinarily occurs through the walls of porous prostheses when circulation is reestablished after the graft is inserted. Dacron prostheses which had been coated with Gelfoam permitted significant blood loss, as did prostheses which had been pre-clotted by immersion in blood from the host dogs. Grafts coated with Silastic, a silicone rubber, were nearly impervious to blood. Silicone reduced the initial interstitial blood loss dramatically, but the grafts were too stiff for easy anastomosis. The Silastic prevented penetration of the interstices of the graft by fibroblasts from the adventitial surface. The neo-intima was organized by fibroblasts which grew in from the ends of the graft. Despite the failure of host tissue to penetrate the interstices of the prostheses, all grafts remained patent. (Author)

AD-268 795 Div. 16
(TISTB/CCH) OTS price $1.10

School of Aerospace Medicine, Brooks Air Force Base, Texas.
DETERMINATION OF THE DISSOCIATION CONSTANTS OF CHLOROPHENOL RED, PARANITROPHENOL, AND PHENOL RED,
by Frank A. Brown, Ralph G. Allen and Bruce E. Jacobson. Oct 61, 6p. incl. illus. tables, 7 refs. (Rept. no. 61-69)
Unclassified report

DESCRIPTORS: (*Dyes, Dissociation, Determination, Optics.) (*Colorimetric analysis, Hydrogen ion concentration.) (Theory, Physical properties, Measurement, Mathematical analysis.)

AD-268 796 Div. 16
(TISTB/LH) OTS price $1.60

School of Aerospace Medicine, Brooks Air Force Base, Tex.
RE-EXAMINATION OF THE HISTAMINE FLARE TEST AS A SCREENING MEASURE FOR ALLERGIC SENSITIVITY,
by William L. Watson. Aug 61, 14p. incl. illus. table, 5 refs. (Review no. 6-61)
Unclassified report

DESCRIPTORS: *Allergy, *Histamines, Antibodies, Medical examination, Dosage, Skin, Injectors (Medicine).

Intradermal histamine injections and allergy skin tests were administered to allergic and nonallergic subjects. Results of the histamine test indicated no relationship to previous allergic history. Skin tests verified assignment of subjects to allergic and nonallergic groups. The nonallergic subjects, however, showed a median of 2 positive skin-test results--a finding which will be further investigated. (Author)

AD-268 798 Div. 16
(TISTB/CCH) OTS price $1.60

Psycho-Acoustic Lab., Harvard U., Cambridge, Mass.
EXPERIMENTAL MODELS OF THE COCHLEA WITH AND WITHOUT NERVE SUPPLY,
by George von Bekesy. 1961, 18p. incl. illus.
(Rept. no. PNR-229)
(Contract Nonr-186615)
Unclassified report

DESCRIPTORS: (*Ear, *Anatomical models, *Nerves, Stimulation, Hair, Cells (Biology), Experimental data.) (*Hearing, Theory.)

Mechanical models of the cochlea and the organ of Corti are described which use the skin of the arm and the hand as nerve supplies. The advantage of the grouping of the hair cells into inner and outer hair cells has been investigated, and it is shown that such a differentiation into groups of end organs with different sensitivities is useful in decreasing the effects of masking. Furthermore, the grouping makes it possible for the cochlea to produce a spatial discrimination not only for frequency but also to some degree for loudness. (Author)

AD-268 833 Div. 16
(TISTB/LH) OTS price $2.60

Naval Research Lab., Washington, D. C.
STUDIES OF OXYGEN PRODUCTION BY MASS CULTURE OF ALGAE.
Interim rept.,
by P. J. Hannan, Constance Patouillet, and R. Shuler. 6 Dec 61, 23p. incl. illus. tables, 14 refs. (NRL rept. no. 5689)
Unclassified report

DESCRIPTORS: (*Oxygen, Production by *Algae, Growth, Culture media.) (Submarines, Atmosphere, Purification, Theory.)

The two major problems involved in purification of submarine atmospheres are removal of carbon dioxide and replenishment of fresh oxygen. At present two separate processes are used, but the mass culture of algae inside the submarine, with artificial lighting, would perform both functions simultaneously. This study is to determine the feasibility of such an approach. The test organism is the Sorokin strain of Chlorella pyrenoidosa, which has a temperature optimum of 37 to 39 degrees C. The effects on its growth rate of various physical parameters (light intensity, suspension density, etc.) are being studied to determine the optimum design of a mass culture unit. Two small culture units, in which CO2 absorption and O2 production may be measured, were constructed and their performances evaluated. In one, the light path was 3/8 inch and the unit produced approximately 250 cc O2 per hour per liter of suspension. In another, a larger unit with a 2-inch light path, the O2 production was less than 50 cc per hour per liter of suspension despite the use of higher light intensities. This demostrates the necessity of placing the light sources close together in a pilot plant to gain maximum O2 production. (Author)

AD-268 886 Div. 16
(TISTB/LH) OTS price $.50

Aerospace Medical Lab., Aeronautical Systems Div., Wright-Patterson Air Force Base, Ohio.
DEVELOPMENT OF COMBINED AND PRESSURE-COMPENSATED, INHALATION-EXHALATION VALVE FOR PRESSURE BREATHING.
Rept. on Oxygen Dispensing Assemblies,
by Henry W. Seeler. Sep 61, 7p. incl. illus. tables.
(Proj. 6352)
(ASD TR 61-396) Unclassified report

DESCRIPTORS: (*Pneumatic valves, Design, Oxygen equipment.) (*Pressure breathing, Oxygen consumption.)

The development of smaller and lighter weight oxygen masks made necessary the design of a pressure-compensated, inhalation-exhalation valve to replace the three valves normally used in oxygen masks. The valve development program described was in two steps, i.e., the design of a valve with a convoluted compensating diaphragm and the modification of the valve by adding damping chambers and flow resistance reducing characteristics. (Author)

AD-268 895 Div. 16
(TISTB/LH) OTS price $1.50

American Machine and Foundry Co., Nile, Ill.
A CLOSED RESPIRATORY SYSTEM EVALUATOR.
Rept. for 1 July 60-31 May 61 on Equipment For Life Support in Aerospace,
by E. J. Kubiak, J. Rest and R. A. Bambenek. Sep 61, 48p. incl. illus. tables.
(Contract AF 33(616)7392, Proj. 6373)
(ASD TR 61-512) Unclassified report

DESCRIPTORS: (*Respirators, Breathing apparatus, Design, Analysis, Oxygen consumption, Simulation.)

A program to develop a device capable of simulating human respiration and recording the operating characteristics of closed respiratory systems is summarized. The closed respiratory system evaluator is capable of performing all tests necessary to evaluate the performance of any type closed respiratory system. From an analysis of all conceivable techniques of simulating the respiration of man, it was concluded that a mechanical system is superior to all others. The operation of the evaluator entails the following: (1) oxygen is extracted from the gas flow along with any inert gases, carbon dioxide, and water vapor already present, (2) the inert gases unavoidably removed are added back to the flow from storage, (3) carbon dioxide and water vapor are added from storage in an amount equal to the desired addition rate plus that quantity unavoidably removed by oxygen extraction. The capabilities of the evaluator are: (1) oxygen removal rate of 0.02 to 0.85 lb/hr at STP, (2) carbon dioxide addition rate of 0.02 to 2.8 lbs/hr, (3) sensible heat addition rate of 0 to 300 BTU/hr, and (4) water vapor addition rate of 0.02 to 0.9 lb/hr. (Author)

AD-268 935 Div. 16
(TISTB/CCH) OTS price $1.60

Naval Research Lab., Washington, D. C.
A FORCE-AREA STUDY OF OVOMUCOID FILMS.
Final rept.,
by John D. Bultman. 6 Dec 61, 9p. incl. illus. table, 33 refs. (NRL rept. no. 5719)
Unclassified report

DESCRIPTORS: (*Protein, Films, Chemical properties, Surface properties, Molecular structure, Molecules.)

An investigation of the surface chemical behavior of the glycoprotein, ovomucoid, was undertaken. Monomolecular layers of this material were deposited on substrate solutions of ammonium sulfate, the surface concentration varying from 9.7 x 10 to the 14th power to 2.16 x 10 to the 15th power molecules per film. The force-area measurements were made on a Wilhelmy film balance. A brief description of the apparatus and the operational technique is included. (Author)

17. METALLURGY

AD-268 191 Div. 17, 25, 4
(TISTM/GEC) OTS price $1.60

Watertown Arsenal Labs., Mass.
THE LATTICE PARAMETERS OF IRON-RUTHENIUM SOLID SOLUTION ALLOYS,
by Leo J. Cotta, Jr. and Charles P. Gazzara.
Nov 61, 11p. incl. illus. 9 refs. (Technical rept. no. WAL TR 830.2/1)
(Proj. 593-32-001)
Unclassified report

DESCRIPTORS: (Lattices of *Iron alloys, *Ruthenium compounds, Solids, Solutions, Preparation, Powder alloys, Powder metallurgy.) (Test methods, Temperature, (X-ray diffraction analysis, Chemical analysis.)

The lattice parameters of iron-ruthenium solid solution alloys of 0.10, 0.20, 0.50, 0.75, 1.50, 2.25, and 3.00 weight percent ruthenium were determined at 310 K using a Philips back-reflection focusing camera and annealed-powder specimens. (Author)

AD-268 275 Div. 17
(TISTM/TCG) OTS price $1.60

Fulmer Research Inst., Ltd. (Gt. Brit.).
THE SPACING OF SLIP LINES IN METALS.
Annual technical rept. no. 1, Nov 60-Oct 61,
by J. T. Barnby. Oct 61, 15p. incl. illus. tables, 22 refs.
(Contract DA 91-591-EUC-1625)
Unclassified report

DESCRIPTORS: (*Metals, *Brass, Zinc alloys, Copper alloys, Crystals, Stresses, Tensile properties, Mechanical properties, Measurement, Theory.) (*Crystal structure, Lattices, Grains (Metallurgy).)

Yield stresses of polycrystalline brass tensile specimens were measured at 25 and -196 C. The grain sizes of the specimens were varied, and the yield strength was found to obey the relation sigma sub y = sigma sub i + k sub y 1/d to the 1/2 power where d is the average grain diameter and sigma sub i and k sub y are constants for a given test temperature and composition. Both temperature and composition were varied, and the dependence of sigma sub i and k sub y on these parameters was studied. Since k sub y is practically independent of temperature it is suggested that the dislocation locking, which is theoretically proportional to k sub y, is the type involving segregation of solute to stacking faults. Values of sigma sub i decreased initially with increasing Zn content of the alloys. The behaviour of sigma sub i and k sub y is compared with work on the spacing of slip lines. (Author)

AD-268 312 Div. 17, 27, 31, 22, 26
(TISTM/GEC) OTS price $.50

Battelle Memorial Inst., Columbus, Ohio.
REVIEW OF RECENT DEVELOPMENTS IN METALS JOINING.
Rept. for 30 July-30 Oct 61,
by J. J. Vagi, W. J. Lewis and H. W. Mishler.
6 Dec 61, 8p. incl. 12 refs. (DMIC memo. no. 140)
Unclassified report

DESCRIPTORS: (Metals, Metallurgy, Alloys, Sheets, *Metal joints, Titanium alloys, Niobium alloys, Tungsten, Molybdenum alloys, Steel.) (Manufacturing methods, Processing, Arc welding, Welding, Electron beams, Flash welds, Ultrasonics.) (Tests, Mechanical properties, Fracture (Mechanics), Tensile properties, Impact shock, Deformation, Hardness, Microstructure, Temperature.) (Radiographic analysis, Metallurgical analysis.)

Contents:
Titanium-base alloys
  Arc welding
  Ultrasonic welding
  Electron-beam welding
Niobium-base alloys
Tungsten
  Electron-beam welding
Molybdenum-0.5 Titanium alloy
  Electron-beam welding
Armor steels
Weight saving by flash welding

AD-268 353 Div. 17, 26
(TISTM/TCG) OTS price $33.50

Syracuse U. Research Inst., N. Y.
PROCEEDINGS OF THE SEVENTH SAGAMORE ORDNANCE MATERIALS RESEARCH CONFERENCE. MECHANICAL AND METALLURGICAL BEHAVIOR OF SHEET MATERIALS, CONDUCTED AT SAGAMORE CONFERENCE CENTER, RAQUETTE LAKE, NEW YORK, AUGUST 16 TO 19, 1960.
1960, 1v. incl. illus. tables, refs.
(Contract DA 30-069-ORD-2566)
Unclassified report

DESCRIPTORS: (*Heat resistant alloys, Alloys, *Metals, *Sheets, Mechanical properties, Metallurgy, Production, Test methods, Manufacturing methods.) (Steel, Stainless steel, Titanium alloys.) (Aircraft, Rocket cases, Ship hulls, Pressure vessels.) (Tensile properties, *Fracture (Mechanics), Shear stresses, Stresses, Plasticity, Deformation, Hardness, Microstructure, Heat treatment, Processing.) *Conferences, Model tests, Tests, Supersonic planes, Transport planes.

Contents:
Requirements of high strength sheet materials
Materials, their properties and characteristics
Effects of fabrication variables
Fracture, crack initation and propagation
Mechanical screening tests
Mechanical model testing
The materials problems of the supersonic transport

AD-268 395 Div. 17, 14, 32
(TISTM/GEL) OTS price $6.60

Defense Metals Information Center, Columbus, Ohio.
DEFENSE METALS INFORMATION CENTER SELECTED ACCESSIONS. NOVEMBER 1961,
comp. by Virginia L. Frazier. Nov 61, 52p.
Unclassified report

DESCRIPTORS: (*Bibliography, *Metals, *Alloys, Ceramic materials, *Refractory materials, Coatings, Steel.)

Contents:
Author index
Subject index
High-strength alloys (Cobalt base, nickel base, engineering steels, stainless steels, iron base)
Light metals (Beryllium, titanium, silicon)
Nonmetallics (Carbon, graphite, special refractories, ceramic oxide)
Refractory metals (Niobium, chromium, molybdenum, rhenium, tantalum, vanadium, tungsten)
Miscellaneous (Coatings, applications, and composites)

AD-268 412 Div. 17, 25
(TISTM/GEC) OTS price $4.60

Belfour Engineering Co., Suttons Bay, Mich.
FATIGUE OF METALS. CORROSION AND HEAT RESISTANT METALS. SECTION I.
Rept. on Mechanical Properties Information Processing System.
Nov 61, 37p. incl. illus. table, 20 refs.
(Contract AF 33(616)7238, Proj. 7381)
(ASD TN 61-117, pt. 2) Unclassified report

DESCRIPTORS: (*Metals, Alloys, *Heat resistant alloys, *Corrosion-resistant alloys, *Fatigue (Mechanics).) (Iron alloys, Cobalt alloys, Chromium alloys, Nickel alloys, Molybdenum alloys, Stainless steel, Titanium alloys.)

Metals fatigue information from various sources of published and unpublished test reports which were processed and regenerated through a semi-automatic data processing system are graphically reported. The graphs contain descriptive information (legends) which identifies the material, test procedure, test conditions and the most significant test and/or material variables associated with the plotted data. The data displayed is intended to answer general questions and to serve as a guide to further investigation of specific areas within the subject presented. (Author)

AD-268 438 Div. 17, 25
(TISTM/GEC) OTS price $5.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
THE EFFECT OF CONCURRENT STRAINING AND A 1-PERCENT MAGNESIUM ADDITION ON THE RECOVERY BEHAVIOR OF ALUMINUM.
Rept. for 1 Apr 60-1 Feb 61, on Metallic Materials,
by T. E. Tietz, C. L. Meyers, and J. L. Lytton.
May 61, 52p. incl. illus. tables, 21 refs.
(Rept. no. LMSD-895071)
(Contract AF 33(616)7156, Proj. 7351)
(WADD TR 61-138) Unclassified report

DESCRIPTORS: (Metals, *Aluminum, *Aluminum alloys, Magnesium alloys, Tensile properties, Elasticity, Creep, Stresses, Heat treatment, Relaxation time.) Test equipment, Test methods.

The effect of elastic strain, concurrent creep strain, and a 1% Mg addition on the recovery behavior of a high-purity Al was investigated. The degree of recovery of the prestrained test material was measured in terms of tensile flow stress at room temperature after recovery treatments between 80 and 200 C. Recovery behavior under no-load conditions was evaluated for the 99.995% Al and the Al-1% Mg alloy. The effect of concurrent elastic strain and creep straining during recovery of 99.995% Al was also studied. The activation energy for recovery of the 99.995% Al between 80 and 200 C was found to be 23,300 ± 2,000 cal/mole, and the activation energy for the Al-1% Mg alloy was 27,500 cal/mole. Concurrent elastic strain was concluded to have no effect on the rate of recovery of the 99.995% Al in terms of flow stress, but concurrent creep straining had a significant effect. The activation energy of the recovery process was not significantly different as a result of concurrent creep straining. (Author)

AD-268 468 Div. 17, 26
(TISTM/BRW) OTS price $8.10

Metals Processing Lab., Mass. Inst. of Tech., Cambridge.
RESEARCH ON PARAMETERS INFLUENCING FLUIDITY IN ALUMINUM BASE ALLOYS.
Final rept.
1 Jan 61, 72p. incl. illus. tables, 16 refs.
(Contract DA 19-020-ORD-4503)
Unclassified report

DESCRIPTORS: (*Aluminum alloys, Copper alloys, *Castings, Molding, Fluid flow, Viscosity, Surface tension, Vibration, Hydrostatic pressure, Heat transfer, Molding materials, Mold washes, Test methods.) (Metals, Processing, Theory.)

Continued efforts were directed at studies of (1) effects of surface tension and vibration on ability of metal to enter small diameter test channels and fluidity of metal in these test channels, and (2) effects of heat transfer variables on fluidity in standard size test channels (the order of 1/8-in. thick). The effects of surface tension and vibration on metal flow were studied by vacuum fluidity testing in small tubes with small metallostatic heads. Similar studies were conducted with a sand mold test but with small diameter channels to determine the effects of surface tension and vibration on metal flow. Vibration was applied so that it increased metallostatic head at the test channel opening. Methods of minimizing heat losses during the filling of a casting cavity included (1) increasing mold temperature, (2) decreasing mold diffusivity, (3) applying heat to the mold-metal interface during the filling of casting cavity, and (4) applying heat to a runner system during filling of a casting cavity. A theoretical analysis of heat losses in runners is presented which compares theory with experimental results. (Author)

AD-268 558 Div. 17
(TISTM/TCG) OTS price $4.60

Armour Research Foundation, Chicago, Ill.
FRACTURE OF METALS.
Summary rept., 1 Aug 60-30 Sep 61.
30 Sep 61, 39p. incl. illus. tables, 14 refs.
(Rept. no. ARF 2183-8)
(Contract DA 11-022-ORD-3108, Proj. TB4-001, M219)
Unclassified report

DESCRIPTORS: (*Fracture (Mechanics), *Metals, Alloys, Brittle materials, Liquid metals, Wetting agents, Grains (Metallurgy).) (Surface properties, Tensile properties, Stresses, Corrosion, Crazing, Heat treatment.) (*Aluminum alloys, Mercury.) (Steel, Hydrogen, Lithium.)

A study was made of the mechanism of brittle fracture produced in engineering metals under stress when wetted by certain low-melting liquid metals and the relation these phenomena have to similar behavior in other environments. The embrittlement by mercury of Al alloys in various states of anneal, cold work, and aging was studied. Sub-yield point failure is confined to dispersion-hardened structures and is intensified by combinations of aging and small degrees of cold work. Large plastic strains imposed upon the aged state reduce the level of embrittlement. The case is made that a critical strain rather than a critical stress condition governs the occurrence of brittle fracture. A model for the various trends of embrittlement was built from considerations of slip plane population, coherency stress fields, and the interactions between these. The conditions for sub-yield point brittle fracture in quenched and tempered 300M steel as-H-charged or as-wetted with molten Li are the same. The embrittlement by stress-corrosion of Al alloys is being studied to indicate that the embrittlement was basically similar to that produced by wetting with liquid Hg. (Author)

AD-268 569 Div. 17, 30
(TISTM/TCG) OTS price $1.00

Directorate of Materials and Processes, Aeronautical Systems Div., Wright-Patterson Air Force Base, Ohio.
EFFECT OF CORROSION ON THE FATIGUE BEHAVIOR OF 2024-T4 ALUMINUM ALLOY.
Rept. for Sep 59-Mar 61 on Materials Application, by Clayton L. Harmsworth. July 61, 31p. incl. illus. tables, 4 refs.
(Proj. 7381)
(ASD TR 61-121) Unclassified report

DESCRIPTORS: (*Aluminum alloys, *Corrosion, Pickling, *Fatigue (Mechanics), Stresses, Tensile properties, Surface properties, Measurement, Tests, Test methods.)

An investigation was conducted to determine the effect of corrosion pitting on the fatigue behavior of 2024-T4 aluminum alloy and to establish a method of measuring pitting corrosion damage with respect to fatigue. Surface roughness measurements were used to give a useful indication of the fatigue life that may be expected from a corroded structural member of 2024-T4 aluminum. The effect of pre-existing corrosion on the mechanism of fatigue was determined to be largely that of a stress raiser. In the case of pitting corrosion, calculations could be made, based upon critical pit measurements, to determine the stress concentration effect of the corrosion pit. (Author)

AD-268 627 Div. 17
(TISTM/TCG) OTS price $2.60

Committee on Ship Structure, National Research Council, Washington, D. C.
THE INFLUENCE OF MECHANICAL FIBERING ON BRITTLE FRACTURE IN HOT-ROLLED STEEL PLATE.
Progress rept. no. 2 on Proj. SR-147, by B. M. Kapadia, A. T. English, and W. A. Backofen. 1 Dec 61, 17p. incl. illus. table, 23 refs. (Serial no. SSC-138)
(Contract NObs-84321; In cooperation with Massachusetts Inst. of Tech., Cambridge, Contract NObs-72386)
Unclassified report

DESCRIPTORS: (*Steel, Ship plates, *Metal plates, Ferrites, Austenite, Rolling mills, Microstructure, Transition temperature, Plasticity, Deformation, *Fracture (Mechanics), Stresses, Tensile properties, Grains (Metallurgy), Processing, Temperature.)

Several factors are involved in the formation of fissures on a microscale: the presence of finely dispersed fiber elements, plastic strain, and a stress normal to any plane in which the fiber is aligned. The strain and stress factors were found to different degrees in the various tests, so that the contribution of the extra-grain-size effect to transition temperature depended on the test employed and the criterion for transition. A classification was suggested from van der Veen notched slow-bend, to Charpy V-notch, to pure tensile loading, on the basis of decreasing tendency to promote fissuring at transition. Using the van der Veen test and 32-mm fibrous criterion, the transition temperature for controlled-rolled plate is lowered for reasons other than grain refinement by 10-15 C, or 2-3 times that when the temperature is taken at the Charpy V-notch 15 ft-lb level. (Author)

AD-268 634 Div. 17, 27
(TISTM/EJH) OTS price $1.10

Aerojet-General Corp., Azusa, Calif.
INVESTIGATION OF STRESS-CORROSION CRACKING OF HIGH-STRENGTH ALLOYS.
Informal progress rept. no. 11, 1-31 Oct 61. 4 Dec 61, 2p. tables (Rept. no. L0414-01-11)
(Contract DA-04-495-ORD-3069)
Unclassified report

DESCRIPTORS: (Rocket cases, Rocket motors, Materials, Heat resistant alloys, *Alloys, *Steel, *Stainless steel, *Titanium alloys, Stresses, Corrosion, Fracture (Mechanics).) (Test methods, Corrosive liquids, Corrosive gases, Failure (Mechanics).)

Results of environmental bent-beam stress-corrosion tests for specimens of Ladish D6AC, Type 300 M and Vascojet 1000 alloy steels, AM355 and PH 15-7 Mo stainless steels, and B120VCA Ti alloy are presented in tabular form. Results of all the environmental U-bend stress-corrosion tests compiled to date for specimens of Ladish D6AC, Type 300M and Vascojet 1000 alloy steels are also presented; whenever failure occurred, the comparative time-to-failure of the Vascojet 1000 specimens was the least, while that of the Ladish D6AC was the greatest. Tests environments included air, distilled water, tap water, 0.25% $Na_2Cr_2O_7$ solution, marquench salt solution, 0.3% NaCl solution, C_2HCl_3, cosmoline, 4% soluble oil, high humidity.

AD-268 647 Div. 17
(TISTM/GEC) OTS price $2.50

Defense Metals Information Center, Columbus, Ohio.
INTRODUCTION TO METALS FOR ELEVATED-TEMPERATURE

USE,
by J. E. Campbell, H. B. Goodwin and others.
27 Oct 61, 1v. incl. illus. tables (DMIC rept. no. 160)

Unclassified report

DESCRIPTORS: (*Metals, *Alloys, *Refractory materials, *Heat resistant alloys, Coatings.) (Abundance, Production, Mechanical properties, Physical properties, Oxidation inhibitors, Corrosion inhibition, Processing, Thermodynamics.) (Tungsten, Tantalum, Molybdenum, Niobium, Vanadium, Chromium, Rhenium, Platinum, Hofnium, Zirconium, Titanium, Iron alloys, Cobalt alloys, Nickel alloys, Beryllium, Aluminum alloys, Magnesium alloys, Steel.) High temperature research.

The general categories of metals suitable for application at temperatures in excess of 800 F are discussed, with the general advantages and limitations of each. Some generalized mechanical- and physical-property data are included, and problems of reactions at elevated temperatures are discussed. (Author)

AD-268 675 Div. 17
(TISTM/EJH) OTS price $3.60

Manufacturing Labs., Inc., Cambridge, Mass.
EFFECT OF MECHANICAL AND THERMAL PROCESSING ON HIGH-STRENGTH STEELS,
by P. J. Fopiano and S. Das Gupta. Dec 61, 27p. incl. illus. tables, 4 refs.
(Contract DA 19-020-ORD-5253, Proj. 593-32-008)
(WAL TR 320.4/4) Unclassified report

DESCRIPTORS: (Rocket cases, *Steel, *Austenite, *Martensite, Mechanical properties, Tensile properties, Stresses, Heat treatment, Processing, Aging, Failure (Mechanics), Fracture (Mechanics).) Microstructure, Test methods, Electron microscopy, High temperature research.)

The relationship between the strain to which rocket motor cases were subjected during proof testing to subsequent premature failure was investigated. Two aspects of the role of strain on the mechanical properties were considered. The first is the effect of strain on the retained austenite and the second is the effect of strain and subsequent retempering on the tempered martensite. In addition to the mechanical property investigation, retained austenite determinations and electron microscopic observations were carried out on specimens in selected conditions of heat-treatment. (Author)

AD-268 688 Div. 17
(TISTM/EJH) OTS price $3.00

Directorate of Materials and Processes, Aeronautical Systems Div., Wright-Patterson Air Force Base, Ohio.
MECHANICAL PROPERTIES OF SOLUTION-TREATED TITANIUM SHEET ALLOY B120VCA.
Rept. for June 59-June 60 on Metallic Materials, by R. G. Henning. Sep 61, 146p. incl. illus. tables.
(Proj. 7351)
(ASD TR 61-337) Unclassified report

DESCRIPTORS: (*Titanium alloys, *Heat resistant alloys, Sheets, Processing, Mechanical properties, Tensile properties, Stresses, Shear stresses, Pressure, Temperature, High temperature research.) (Test equipment, Test methods.) (Aircraft, Guided missiles.)

Mechanical properties of three heats of solution-treated Ti sheet alloy B120VCA were obtained. These properties included tensile, compressive, sheet single shear, bearing and 105 degree bend at temperatures of 200, 400, 600, 800, and 1000 F. Stressed and non-stressed exposure tests were conducted at 600, 800, and 1000 F. All properties were determined in both the transverse and longitudinal rolling directions. Curves are presented for mechanical properties vs test temperature and the ratio of room temperature tensile properties to compressive, bearing and shear properties vs temperature. Typical stress-strain curves for tensile and compression tests were drawn for all test temperatures. (Author)

AD-268 718 Div. 17
(TISTM/GEC) OTS price $2.25

Michigan U., Ann Arbor.
EFFECT OF CREEP-EXPOSURE ON MECHANICAL PROPERTIES OF 80Ni - 20Cr AND TZM MOLYBDENUM ALLOYS.
Rept. for 1 Apr 59-31 May 61 on Materials Application,
by Jeremy V. Gluck and James W. Freeman.
Sep 61, 71p. incl. illus. tables, 20 refs.
(Contract AF 33(616)6462, Proj. 7381)
(ASD TR 61-339)

Unclassified report

DESCRIPTORS: (*Heat resistant alloys, Alloys, *Nickel alloys, *Chromium alloys and *Molybdenum alloys, Titanium alloys, Zirconium alloys, High temperature research.) (Test methods, *Creep, Stresses, Fracture (Mechanics), Mechanical properties, Tensile properties, Impact shock, Grains (Metallurgy), Microstructure, Electron microscopy, X-ray diffraction analysis, Hardness.)

An investigation was made of the influence of creep-exposure at 1000 to 1800 F on mechanical properties of a structurally stable 80Ni - 20Cr alloy. Strain hardening and residual stresses raised strength and lowered ductility for creep at the lower temperatures. With increasing temperature of creep, this factor diminished. Internal microcracking in the grain boundaries occurred increasingly with exposure temperature and creep strain. A large amount of microcracking was required to reduce ductility and, when more severe, to reduce ultimate tensile strength. Two grain sizes were investigated. The fine grained material was less damaged by cracking than the coarse grain material for a given exposure. It was, however, subject to grain growth at intermediate temperatures with a loss in strength. This indicated that internal cracking had to be extensive for appreciable damage. This is due to the low strength and high ductility of the alloy. (Author)

AD-268 724 Div. 17
(TISTM/EJH) OTS price $1.60

Naval Research Lab., Washington, D. C.
CRACK PROPAGATION IN AIR AND IN VACUUM FOR NICKEL AND A NICKEL -CHROMIUM-ALUMINUM ALLOY,
by R. J. Sherman and M. R. Achter. 20 Nov 61, 9p. incl. illus. tables, 7 refs. (NRL rept. no. 5702)

Unclassified report

DESCRIPTORS: (*Nickel, *Nickel alloys, Chromium alloys, Aluminum alloys, *Heat resistant alloys, Fracture (Mechanics), Creep, Mechanical properties, Grains (Metallurgy), Gas diffusion.) (Low pressure research, High temperature research, High pressure research, Low temperature research, Test methods.)

Creep rates have been measured for nickel at 1200 F in air and in vacuum and related to the depth of surface cracks in the specimens tested in the 2 environments. The surface cracks were observed to grow faster in air than in vacuum in both short-time and long-time tests. Crack depths, however, could be correlated with creep rates only in the short-time tests. Although no cracks were observed in a relatively brittle Ni-Cr-Al alloy creep tested at 1300 F, the appearance of alloy specimens fractured after interruption in creep indicated that there was a decrease of intergranular cohesion resulting from the diffusion of atmospheric gases into grain boundaries. (Author)

AD-268 766 Div. 17
(TISTM/EJH) OTS price $.50

Watertown Arsenal Labs., Mass.
SHEAR TEST STUDIES ON 4340 STEEL, TITANIUM ALLOY 6Al-6V-2Sn AND 7075 T6 ALUMINUM.
Report on Special Ammunition - XM28, XM29,
by Armando A. Iannelli. Dec 61, 18p. incl. illus. tables (Technical rept. no. WAL TR 119/2)
(DA Proj. 512-12-018)
Unclassified report

DESCRIPTORS: (Metals, Alloys, *Steel, *Titanium alloys, *Aluminum alloys, Shear stresses, Stresses, Mechanical properties, Test methods, Test equipment, Tensile properties.)

This investigation introduces a double shear jig and notched type specimen, which will meet present needs for determining ultimate shear strength and will establish a first step towards development of a sorely needed standard shear jig. Shear tests were carried out on 4340 steel, Ti alloy 6Al-6V-2Sn and 7075 T6 Al. The tests were run with both circumferentially notched and unnotched cylindrical specimens. The specimen diameters and notch depths were varied. Ultimate shear strength versus shear section diameter curves are presented. The materials tested were found to have the same shear to tensile strength ratio (0.620 ± 0.005). In the range of sizes tested (1/8 to 3/8 inch in diameter), it is revealed that ultimate shear strength is greater for notched than for unnotched specimens, and unaffected by notch depth, and decreases as specimen diameter increases. (Author)

AD-268 776 Div. 17, 25
(TISTM/GEC) OTS price .75

Watertown Arsenal Labs., Mass.
LOW TEMPERATURE MECHANICAL PROPERTIES OF 300 SERIES STAINLESS STEELS AND TITANIUM.
Rept. on Research of Metals and Nonmetallic Materials for Ordnance Construction,
by Thomas S. DeSisto and Frank L. Carr. Dec 61, 32p. incl. illus. tables, 8 refs. (Technical rept. no. WAL TR 323.4/1)
(DA proj. no. 5893-32-002)
Unclassified report

DESCRIPTORS: (*Stainless steel, *Titanium, *Titanium compounds, *Iodides, *Low temperature research, Test equipment, Measurement, Mechanical properties, Tensile properties, Stresses, Deformation, Fracture (Mechanics).) (*Cryostats, Design.) Electronic equipment.

A tensile test cryostat is described for the temperature range -240 to -452 F, which consists of a temperature recording and control system, and a diameter measurement system which includes a scanning control system. True stress-strain properties of the 300 series stainless steels and iodide and commercially pure titanium were obtained from room temperature to -452 F. Serrated load-elongation curves obtained at -452 F and the sequence of deformation in multi-necked specimens at this temperature are discussed. (Author)

AD-268 912 Div. 17
(TISTM/GEC) OTS price $2.00

General Electric Co., Schenectady, N. Y.
EFFECT OF BASIC PHYSICAL PARAMETERS ON ENGINEERING PROPERTIES OF INTERMETALLIC COMPOUNDS.
Rept. for Dec 59-Dec 60 on Refractory Inorganic Non-Metallic Materials,
by J. H. Westbrook and D. L. Wood. Sep 61, 63p. incl. illus. tables, 64 refs.
(Contract AF 33(616)6144, Proj. 7350)
(WADD TR 60-184, pt. 2) Unclassified report

DESCRIPTORS: (*Intermetallic compounds, *Mechanical properties, High temperature research, Low temperature research, *Crystals, Lattices, Grains (Metallurgy), Microstructure, Tensile properties, Stresses, Temperature, Deformation, Fracture mechanics, Relaxation time.) (Silver compounds, Magnesium compounds, Nickel compounds, Aluminum compounds, Bismuth compounds, Thalium compounds, Titanium compounds, Lanthanum compounds, Lead compounds, Wire.)

The tensile behavior of the CsCl structure compound AgMg are extensively documented in terms of strain, strain rate, temperature, grain size, composition, and metallurgical processing treatment. Three regimes of deformation behavior are observed: low temperatures, intermediate temperatures, and high temperatures. In each of these regimes different deformation processes operated. Exploratory studies on other intermetallics are reported. (Author)

AD-268 950 Div. 17
(TISTM/REB) OTS price $4.60

Watertown Arsenal Labs., Mass.
AIR CONTAMINATION OF TITANIUM WELD-HAZ SURFACES.
Rept. for July 57-Jan 60,
by Sheldon S. White, Mark M. D'Andrea, Jr., and Carl E. Hartbower. Dec 61, 43p. incl. illus. tables, 6 refs. (Rept. no. WAL TR 405.1/1-1)
(ASD Proj. 7-662)
(ASD TR 60-7-662) Unclassified report

DESCRIPTORS: (*Titanium, *Titanium alloys, Welds, *Surface properties, Impact shock, Resistance, Contamination by Air, Welding, Heat treatment, High temperature research.)

An investigation was made to determine the effects of air contamination on Ti weld-heat-affected-zone (HAZ) surfaces. Surface effects were measured by a simple impact test. Uncontaminated surfaces subjected to 2000 and 2700 F peak-temperature weld thermal cycles were compared to air-contaminated surfaces subjected to the same thermal cycles. Air-contaminated surfaces resulting from the 2000 F peak temperature consistently yielded higher impact resistance than uncontaminated surfaces subjected to the same thermal cycle. However, air-contaminated surfaces resulting from a 2700 F peak temperature consistently yielded lower impact resistance

than uncontaminated surfaces, as was expected. An explanation is offered for the beneficial effect of an air-contaminated HAZ surface resulting from a 2000 F peak temperature. (Author)

AD-268 975 Div. 17
(TISTM/REB) OTS price $1.60

Boeing Co., Wichita, Kans.
17-7 PH STAINLESS STEEL.
Summary rept. no. 3.
1 Jan 62, 10p. incl. illus. tables (Rept. no. 1-36)
(Contract AF 33(616)8141, Proj. 1(8-7381))
Unclassified report

DESCRIPTORS: (*Stainless steel, Cooling, Tensile properties, Heat treatment.) Mechanical properties.

An experiment was made to determine the tensile properties of 17-7 PH steel after cooling to R.T., 125, 150 and 175 F and quenching to 30 to 60 F and -20 F. Cooling to R.T. (72 F), 125, and 175 F from the austenite conditioning temperature and holding until 1 hour had elapsed, then quenching in 30 to 60 F water did not result in a significant variation in strength. The strength of specimens treated in this manner was predominately in the target range of 180 to 200 KSI. Specimens similarly treated, but quenched to -20 F had little variation in strength. The latter samples were generally too high (above 200,000 psi) in ultimate tensile strength and too low in ductility. Cooling at rates which were similar to anticipated production rates resulted in too low strength and reduced ductility for the lowest cooling rate tested. (Author)

AD-268 999 Div. 17
(TISTM/REB) OTS price $1.10

Armour Research Foundation, Chicago, Ill.
FIBER-REINFORCED METALS AND ALLOYS.
Bimonthly rept. no. 4, 3 Oct-2 Dec 61,
by T. J. Koppenaal and N. M. Parikh. 28 Dec 61, 4p. incl. illus. table (Rept. no. ARF 2221-4)
(Contract NOw 61-0555-c)
Unclassified report

DESCRIPTORS: (*Metals, *Alloys with Reinforcing materials.) (*Aluminum alloys, *Copper alloys with Graphite, Fibers, Processing, Extrusion, Tensile properties.)

A description is given of the preparation and testing of Al-4% Cu matrices reinforced with 5-micron-diameter graphite fibers. The graphite fibers and matrix powders are mixed in a ball mill, thus producing a good mixture of the components. A number of different methods for compositing these materials were investigated. Unsuccessful attempts were made by sintering and hot-pressing. Hot extrusion produced composites significantly stronger than those prepared by simply heating the composites to above the melting point of the matrix. The extrusion temperature varied from 690 to 1100 F. (Author)

18. MILITARY SCIENCES AND OPERATIONS

AD-268 370 Div. 18
(TISTA/VGW) OTS price $1.10

Case Inst. of Tech., Cleveland, Ohio.
AIRCRAFT MAINTENANCE IN A THEATER ARMY. INTRODUCTION AND BRIEF OF THE STUDY.
Rept. on TCCD 59-1,
1959, 11p.
(Contract DA 44-177-tc-507)
Unclassified report

DESCRIPTORS: (Army operations, Logistics, *Maintenance, Airplanes, Military aircraft, Aircraft, Liaison planes, Helicopters, Ground support equipment, Salvage, Feasibility studies.)

A study was made to develop a method to determine and evaluate the best aircraft maintenance system for use by the Army in the field. Its principal objective was not to solve the problem for any one specific set of conditions but to develop a procedure by which Army personnel can arrive at the best solution for any specific set of conditions. (Author)

AD-268 371 Div. 18
(TISTA/VGW) OTS price $1.60

Case Inst. of Tech., Cleveland, Ohio.
COORDINATION ANNEX. ''AIRCRAFT MAINTENANCE IN A THEATER ARMY''.
Rept. on TCCD 59-1.
1959, 17p.
(Contract DA 44-177-tc-507)
Unclassified report

DESCRIPTORS: (Army operations, Logistics, *Maintenance, Airplanes, Military aircraft, Aircraft, Liaison planes, Helicopters, Ground support equipment, Salvage.)

AD-268 372 Div. 18
(TISTB/LH) OTS price $8.10

Massachusetts Inst. of Tech., Cambridge.
RECOMMENDATION ON IMPLEMENTATION OF MASSACHUSETTS INSTITUTE OF TECHNOLOGY RESEARCH IN SECONDARY ITEM SUPPLY CONTROL.
Mar 59, 84p. incl. illus.
(Contract DA 19-020-ORD-2684, Proj. 599-01-004)
Unclassified report

DESCRIPTORS: (Ordnance, *Supplies, *Scheduling, *Quantitative analysis, Costs, Logistics, Procurement.)

An inventory model was revised so that the demand Y sub t in a period of time t is treated as a Compound-Poisson random variable. In addition, the assumption that the difference between maximum stock (R + Q) and stock on hand (N) is a normally distributed random variable was relaxed, and a revised solution for optimal values of R and Q was derived. A method for forecasting the variance-to-mean ratio, used in estimating the standard deviation of demand during the lead time, is presented which is based on a relationship noted during the course of the study between the variance-to-mean ratio of an item and the joint distribution of its mean demand and unit price.

AD-268 555 Div. 18
(TISTB/LH) OTS price $11.00

Army Library, Washington, D. C.
U. S. SECURITY. ARMS CONTROL. AND DISARMAMENT. 1960-1961,
by Harry Moskowitz and Jack Roberts. 1 Oct 61, 144p.

Unclassified report

DESCRIPTORS: (*Bibliography, *National defense, War potential, Military operations, Military intelligence, *Foreign policy, USSR, Great Britain.)

This analytical survey of literature on arms control aims at highlighting the national security needs of the United States. It deals with the objectives of arms control, the problems involved, and the avenues and approaches that are available or must be yet explored along the road of attainment of the final goal. The President's Defense Budget Message to the Congress on 28 March 1961 was used as a guide in the preparation of this bibliography. The Message clearly spells out the principles upon which the U. S. policy on arms control stands. This bibliography covers some of the great outpouring of proposals, suggestions, and recommendations as to policy, strategy, concept, and doctrine. (Author)

AD-268 582 Div. 18, 6, 8
(TISTW/DLW) OTS price $7.60

General Electric Co., Syracuse, N. Y.
AIR WEAPONS CONTROL SYSTEM 412L.
Quarterly reliability program rept. no. 3. 30 Sep 61, 72p. incl. illus. tables (Rept. no AWCS-SQR-3)
(Contract AF 30(635)10117)

Unclassified report

DESCRIPTORS: (*Antiaircraft defense systems, Air control centers, Aircraft intercept control systems, Ground controlled interception systems, *Data processing systems, Display systems, Radar equipment, Communication equipment, Mobile, Europe, *Reliability, Mathematical prediction, Tests, Test methods.)

19. NAVIGATION

AD-268 300 Div. 19, 8
(TISTW/DLW) OTS price $1.25

Antenna Lab., Ohio State U. Research Foundation, Columbus.
AN AIRPORT GLIDE-PATH SYSTEM USING FLUSH-MOUNTED, TRAVELING-WAVE RUNWAY ANTENNAS, VOLUME I.
Rept. on Engineering Services for Glide-Path Antenna System Research,
by Richard H. McFarland. 31 Dec 60, 42p. incl. illus. (Rept. no. 891-1)
(Contract FAA/BRD-116)

Unclassified report

DESCRIPTORS: (*Glide path systems, *Slot antennas, *Instrument landings, Runways, Installation, Design, Antenna radiation patterns, Measurement, Tests.) (Radio navigation, Radio transmitters, Ultra high frequency, Antennas, Underground structures, Tests.)

A five-element, flush-mounted glide-path array and system is discussed which has several salient features: (1) formation of the glide path is not dependent on reflected signals from the earth's surface, thus reducing the effects of terrain in the approach region; (2) the path is radiated from the region of the runway which is precisely the desired destination of the aircraft; and (3) no item of the entire system need extend above the earth's surface, thus eliminating obstacle hazards. The system produces a straight-line path whose vertical limits converge from a thickness of some 400 feet at the outer marker (5 miles from the end of the runway) to approximately 20 feet near the threshold of the runway and then remain essentially parallel. With less than 1/2 watt delivered to each of the 2 basic array antennas, coverage for the glide path is better than 15 miles at 1500 feet. (Author)

AD-268 301 Div. 19, 8, 33
(TISTW/DLW) OTS price $3.00

Antenna Lab., Ohio State U. Research Foundation, Columbus.
AN AIRPORT GLIDE-PATH SYSTEM USING FLUSH-MOUNTED, TRAVELING-WAVE RUNWAY ANTENNAS. VOLUME II.
Rept. on Engineering Services for Glide Path Antenna System Research,
by Richard H. McFarland. 31 Mar 61, 161p. incl. illus. tables, 30 refs. (Rept. no. 891-2)
(Contract FAA/BRD-116)

Unclassified report

DESCRIPTORS: (*Glide path systems, *Slot antennas, Runways, Ultra high frequency, Dielectrics, Instrument landings, Antenna radiation patterns, Installation, Effectiveness, Tests.) (Antennas, Underground structures, Radio navigation.)

A discussion of a new glide-path system is presented which utilizes conventional airborne receiving equipment to provide a pilot with vertical guidance to touchdown on an airport runway. The system uses 5 flush-mounted runway antennas to radiate the UHF glide-path signal from the precise destination of the aircraft. Inasmuch as the antennas are in the ground (runway), no image antennas are present and the path becomes virtually independent of the terrain. Also, no component of the system except possible monitor antennas need extend above ground, thereby eliminating obstruction hazards. The basic theory for this endfire, transverse-electric, traveling wave, dielectric-filled antenna is given, together with results of scale-model measurements. Five array antennas containing polystyrene were built, and impedance and phase velocity tests show them to perform within 2% of predicted values. (Author)

AD-268 493 Div. 19, 12
(TISTW/RD) OTS price $2.60

Research Labs. for the Engineering Sciences, U. of Virginia, Charlottesville.
INVESTIGATION OF CRYOGENIC GYRO,
by R. E. Russell. Dec 61, 28p. incl. illus. 5 refs. (Rept. no. EE-4438-102-61U)
(Contract Nonr-47409)
Unclassified report

DESCRIPTORS: (*Gyroscopes, Superconductors, Spheres, Magnetic fields, Superconductivity, Cryogenics.) (*Inertial guidance, Instrumentation.) (Magnetic effects of Magnetic moments on Gyroscopes, Mathematical analysis.)

A cryogenic gyro, employing a superconducting sphere, stably supported by a magnetic field is described. Specific areas considered are: (1) the London theory for a rotating superconductor; (2) precession rates due to spin-induced moment; and (3) interaction of the spin-induced moment with the support field gradient.

AD-268 866 Div. 19, 2
(TISTP/WH) OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
ON THE THEORY OF UNPERTURBED SYSTEMS WITH THREE CHANNELS FOR COMPENSATING ACCELERATIONS, DUE TO GRAVITATION FORCES (K Teorii Nevozmushchayemykh Sistem S Trema Kanalami Avtokompensatsii Uskoreniy Ot Sil Tyagoteniya),
by V. A. Bodner and V. P. Seleznev. 6 Dec 61, 14p. incl. illus. table (Trans. no. FTD-TT-61-65 of Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Energetika i Avtomatika 1:76-85, 1960)
Unclassified report

DESCRIPTORS: (*Inertial guidance, Corrections, Gravity, Accelerometers.) (*Celestial mechanics, Space flight, Space navigation, Acceleration.) USSR.

20. NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

AD-268 156 Div. 20, 4, 25
(TISTM/GEC) OTS price $3.60

Naval Radiological Defense Lab., San Francisco, Calif.
GAS-CHROMATOGRAPHIC SEPARATIONS OF RARE GASES,
by C. L. Carnahan. 2 Nov 61, 36p. incl. illus. tables, 26 refs. (Rept. no. NRDL-TR-535)
Unclassified report

DESCRIPTORS: (Gases, Mixtures, Oxygen, Nitrogen, *Rare gases, *Argon, *Krypton, *Xenon, Fission products, *Separation by Chromatographic analysis.) (Adsorbents, Hydrates, Calcium compounds, Aluminum compounds, Sodium compounds, Silicates.) (Atmosphere, Contamination, Radiological contamination, Radioactive isotopes, Nuclear power plants, Nuclear explosions.) (Test methods, Temperature, Thermal conductivity, Detection, Theory.)

A procedure was developed for the separation of the rare gases argon, krypton, and xenon from mixtures containing oxygen and nitrogen by use of gas-chromatographic columns packed with molecular sieve type 5A. He was the carrier gas. The method is applicable to mixtures which were considerably enriched in the rare gases. The procedure involves: separation of xenon from oxygen, nitrogen, argon, and krypton on a short column at or above room temperature; separation of krypton from oxygen, nitrogen, and argon on a long column at -20 C; separation of argon from oxygen on the long column at -50 C. The net reduced retention volumes and heats of adsorption were determined for oxygen, nitrogen, argon, krypton and xenon on molecular sieves types 4A, 5A and 13X. Voltage output of the differential thermal conductivity detector was measured as a function of the quantity of gas being measured. It is estimated that the presence of about 6 x 10 to the -11th power mole, or 0.1 ppm in 25 cc of sample, can be detected. Quantitative measurements can be made down to about 5 x 10 to the -9th power mole, or 10 ppm in 25 cc of sample. (Author)

AD-268 181 Div. 20, 25
(TISTP/JW) OTS price $11.00

High Energy Physics Lab., Stanford U., Calif.
PHOTOPROTONS FROM OXYGEN, FLUORINE, NEON, AND OTHER LIGHT ELEMENTS.
Technical rept. on Linear Electron Accelerator Project,
by William R. Dodge. Oct 61, 133p. incl. illus. tables, 76 refs.
(HEPL Rept. no. 246)
(Contract N6onr-25116)
Unclassified report

DESCRIPTORS: (Energy, Electrons, *Protons.) (Targets, Oxygen, Neon, Carbon, Fluorine.) (*Gamma proton reaction, Nuclear reactions, Inelastic scattering.) *Bremsstrahlung.

The (gamma, proton) reaction in O, F, Ne, and C was studied with electrons of energies up to 36 mev. Survey studies were made of the Al, A, and B (gamma, proton) energy spectra. The studies were based on a one-to-one correspondence between electron- and photon-induced reactions. It was assumed that when analyzing electron-production yields, the electron has associated with it a virtual-photon spectrum, similar to the real-photon bremsstrahlung spectrum. The virtual and bremsstrahlung spectra differ in the virtual-photon spectrum depends on the multipolarity of the induced transition and the angle between the incident electron beam and the emitted disintegration product. The electron production yields were analyzed with the use of the E-1 virtual-photon spectrum.

AD-268 198 Div. 20
(TISTP/WH) OTS price $1.60

Uppsala U., (Sweden).
ON THE PRESSURE DEPENDENCE OF THE COSMIC RAY INTENSITY RECORDED BY THE STANDARD NEUTRON MONITOR,
by Stig Lindgren. 7 Apr 61, 7p. illus. 12 refs.
(Technical note no. 7)
(Contract AF 61(514)1312)
(AFCRL-659) Unclassified report

DESCRIPTORS: (*Cosmic rays, Intensity, Measurement.) (Cosmic rays, Instrumentation, Monitors, *Neutron detectors, Pressure, Atmosphere.) Canada.

Pressure coefficients were determined for some standard neutron monitors at high latitudes for years 1957-1959 with due regard to variations of primary origin. The following coefficients were obtained: (1) for Murchison Bay and Uppsala -0.710 + or - 0.006 per cent/mb; (2) for Resolute, Churchill and Ottawa -0.725 + or - 0.005 per cent/mb; (3) for Mawson and Mt. Wellington -0.736 + or - 0.004 per cent/mb. The differences between the three groups of stations are certainly real to some extent. They probably reflect dissimilarities in the neutron monitors and the pressure recording devices. As a by-product it has proved that for two stations above the latitude knee, the quotient between the pressure corrected daily neutron intensities is remarkably constant in time. It can thus be used as a sensitive indicator of changes in counting rate. (Author)

AD-268 608 Div. 20, 2
(TISTM/EJH) OTS price $2.60

Naval Research Lab., Washington, D. C.
FISSION PRODUCT RADIOACTIVITY IN THE AIR ALONG THE 80TH MERIDIAN (WEST) DURING 1960.
Interim rept.,
by L. B. Lockhart, Jr., R. L. Patterson, Jr. and others. 24 Oct 61, 18p. incl. illus. tables, 7 refs. (NRL rept. no. 5692)
(Proj. RR 004-02-41-5151)
Unclassified report

DESCRIPTORS: (Air, Radioactivity, *Atmosphere, Contamination, Western hemisphere, Atomic bomb explosions, Nuclear explosions, Fission products, *Radioactive isotopes, *Radioactive fall-out, Sampling.)

Since 1956, the U. S.NRL has had a continuing study of radioactivity in air along the 80th meridian (West). The year 1960 brought progressive decreases in airborne fission product radioactivity. The activity levels in the Northern and Southern Hemispheres gave indications of approaching equilibrium. However, 2 years after the cessation of the major nuclear test programs, differences in the fission product compositions of the two hemispheres still exist. The relatively small amounts of radioactivity generated by the French nuclear tests in the Sahara produced only transient effects at a few sites along the 80th meridian. Fission product ratios involving some of the shorter-lived fission products did document the presence of debris from the February 1960 test in a band extending from Miami, Florida, to Grayaquil, Ecuador, with the suggestion that small amounts of debris did appear in other areas. (Author)

AD-268 660 Div. 20
(TISTP/TL) OTS price $14.00

Illinois U., Urbana.
SCATTERING OF K(-)MESONS BY NUCLEI,
by Jack Harley Hetherington. Dec 61, 201p. incl. illus. tables, 51 refs. (Technical rept. no. 29)
(Contract Nonr-183405)
Unclassified report

DESCRIPTORS: (Mesons, *Meson scattering, Proton reactions, *Proton scattering, Nuclei. Elasticity, Hyperons, Pions, Nucleons.) (Scattering, Optics, Potential theory, Hydrogen, *Bubble chamber, Wave analysis, Optics.) (Differential equations, Sampling, Partial differential equations, Matrix algebra, Statistical processes, Probability, Series.)

A K-meson colliding with a proton may (1) scatter elastically, (2) scatter with charge exchange, or (3) undergo one of several inelastic reactions with production of a hyperon and one or two pions. Experiments to measure the cross sections for these processes were carried out using a hydrogen bubble chamber and using nuclear emulsions. Possible reactions are shown in Table I with some of the experimentally determined cross sections. (Author)

AD-268 679 Div. 20
(TISTM/TCG) OTS price $12.50

Laboratory for Nuclear Science, Mass. Inst. of Tech., Cambridge.
(No title).
Progress rept. no. 58 for period ending 30 Apr 61.
1 May 61, 171p. incl. illus. tables, 48 refs.
(Contract NASw-37 and NASw-75)
Unclassified report

DESCRIPTORS: (*Nuclear physics, *Particle accelerators, *Radiochemistry, Cyclotrons, Cosmic rays, Fission, Nuclear reactions, Generators, Radioactivity, Theory.) Bubble chambers.

Contents:
Nuclear chemistry
Chemistry of the fission elements
Cosmic rays
High energy accelerator physics
Bubble chamber
Linear accelerator
Rockefeller generator
ONR generator
Radioactivity
Cyclotron
Theoretical

AD-268 744 Div. 20, 15
(TISTP/TL) OTS price $5.60

Illinois U., Urbana.
ELECTRIC DIPOLE GROUND STATE TRANSITION WIDTH STRENGTH FUNCTION AND 7 MEV PHOTON INTERACTIONS,
by Peter Axel. Nov 61, 54p. incl. tables, 48 refs. (Technical rept. no. 30)
(Contract Nonr-183405)
Unclassified report

DESCRIPTORS: (*Electric dipole transition, *Photons, Photonuclear reactions, Absorption, *Nuclear physics.) (Electromagnetic waves, Neutron cross section, Neutron capture, Gamma rays, Energy, Scattering, Nuclei, Molecules, Temperature.) (Integration, Functions, Bessel functions, Statistical functions.)

Formulas are given which describe some significant effects that a Porter-Thomas distribution of ground state transition widths would have on the interpretation of the nuclear interaction of photons which reach closely spaced, but

separated energy levels. When these formulas are used to reinterpret existing data, the parameters implied by photon interaction become consistent with those resulting from neutron capture data. These compatible parameters are further shown to be consistent with a crude generalized extrapolation of the giant dipole resonance. (Author)

AD-268 750 Div. 20, 4
(TISTM/EJH) OTS price $2.60

Nuclear Defense Lab., Army Chemical Center, Md.
A BROAD RANGE CHEMICAL DOSIMETER FOR GAMMA RADIATION,
by Nathan Klein. July 61, 27p. incl. illus. tables, 20 refs. (Rept. no. NDL-TR-7)
Unclassified report

DESCRIPTORS: (*Dosimeters, Dose rate, Gamma rays, Measurement, Radiation effects, Sensitivity, Test methods, Reliability.) (*Phenols, Water, Phenyl radicals, Imines, Ketones, Benzenes, Chemical analysis, *Chemical indicators.) Spectrographic analysis.

A chemical dosimeter that consists of an air-saturated aqueous solution of benzene is described. When irradiated, the system produces phenol in yields of approximately 2 x 10 to the -6th power moles/liter/1000 rads. A technique for the quantitative determination of phenol in concentrations as low as 10 to the -8th power M is described also. (Author)

AD-268 755 Div. 20
(TISTB/LH) OTS price $2.60

Radiation Effects Information Center, Columbus, Ohio.
MONTHLY ACCESSION LIST 53.
Rept. for 1-30 Nov 61.
15 Dec 61, 19p. (REIC Accession list no. 53)
(Contract AF 33(616)7375, Proj. 1448)
Unclassified report

DESCRIPTORS: (*Bibliography, *Radiation effects, *Radiation damage, Inorganic substances, Organic compounds, Electronics, Polymers, Metals, Ceramic materials.)

AD-268 958 Div. 20, 25
(TISTP/JW) OTS price $5.60

Air Force Special Weapons Center, Kirtland Air Force Base, N. Mex.
THE TRANSPORT OF NEUTRONS THROUGH THE ATMOSPHERES FOR A BURST HEIGHT OF 70,000 FEET,
by Alexander E. Anthony, Jr. Oct 61, 54p. incl. illus. tables, 5 refs. (Rept. no. TR-61-85)
Unclassified report

DESCRIPTORS: (*Neutron flux density, Atomic bomb expplosives, Exosphere, Atmosphere, Mathematical analysis, *Transport properties.)

A series of curves is presented depicting the neutron flux per initial neutron from a burst height of 70,000 feet and sampling altitudes from 50,000 to 100,000 feet. The scattered flux data for these curves were calculated from a Monte Carlo code. The direct flux data were calculated by the standard inverse square method. (Author)

21. NUCLEAR PROPULSION

AD-268 890 Div. 21, 12
(TISTW/DLW) OTS price $21.00

Research and Advanced Development Div., AVCO Corp., Wilmington, Mass.
INVESTIGATION OF RE-ENTRY DESTRUCTION OF NUCLEAR AUXILIARY POWERPLANT.
Oct 61, 348p. incl. illus. tables (Technical rept. no. RAD TR 61-28)
(Contract AF 33(616)7530)
(AFSWC TR 61-69) Unclassified report

DESCRIPTORS: (*Satellite vehicles, *Nuclear power plants, Nuclear propulsion, *Re-entry vehicles, Re-entry aerodynamics, Safety, Aerodynamic heating, Hypersonic wind tunnels, Tests.) (*Auxiliary power plants, Nuclear energy, Reactor fuels, Materials, Melting, Probability, Tests.)

Work was undertaken to determine how the re-entry of a nuclear reactor from orbit can be made inherently harmless by the re-entry environment alone and without the use of fallible components. The problems involved in the re-entry destruction of a nuclear reactor (fuel-element exposure, meltdown of the fuel elements, dispersal of the molten residue, and combustion of the molten residue) were investigated by theoretical and experimental techniques. Results indicate that without modification, flight models of the August 1960 developmental reactor-vehicle systems considered will not be reduced to a harmless residue by the re-entry environment. However, the parametric and design studies are relatively general, and they may be useful to designers in developing this and other reactor-vehicle systems for safe re-entry. (Author)

22. ORDNANCE

AD-268 131 Div. 22
(TISTW/EET) OTS price $1.60

Ogden Air Materiel Area, Hill Air Force Base, Utah.
SERVICEABILITY TESTS OF CONTINUITY TEST STAND USED WITH THE 2.75 INCH FOLDING FIN AIR ROCKET.
Airmunitions test rept.,
by John H. Schnabel. Dec 61, 11p. incl. illus.
(Rept. no. OOY TR 61-51)
Unclassified report

DESCRIPTORS: (*Rocket motors, *Rocket igniters, *Rocket heads, *Rocket fuzes, Detonation, *Test equipment, Test methods, Reliability, Tests, Military requirements.) (Aircraft ammunition, Rockets, Tests.)

The 2.75 Inch Rocket Igniter is continuity tested by placing the rocket in a suitable holding fixture and testing with a meter. The purposes of this test were: (1) to determine if a typical holding stand would retain rockets, with inert

or high explosive heads, should a motor be accidentally ignited during the continuity check; (2) to determine the effect on the warhead if the motor ignites while being retained in the stand; and (3) to determine the capability of the stand in retaining adjacent rockets in the event a warhead is detonated. The stand was satisfactory in that: (1) the rocket(s) did not escape from the stand; (2) the adjacent rockets were not damaged or ignited; and (3) the H.E. head did not detonate when the motor was functioned. The 2.75 inch rocket continuity test stand of the design tested will satisfactorily retain rocket motors, assemble with inert or H.E. heads, should a motor(s) be accidentally ignited. (Author)

AD-268 164 Div. 22
(TISTW/EET) OTS price $1.60

Ogden Air Materiel Area, Hill Air Force Base, Utah.
SERVICEABILITY AND FUNCTION TEST OF PRIMER DETONATOR, M14.
Airmunitions test rept.,
by James L. Higgins. Nov 61, 14p. incl. illus. tables (Rept. no. OOY TR 61-47)
Unclassified report

DESCRIPTORS: (*Bomb fuzes, Primers, Detonators, *Delay elements, Military requirements, Tests, Test equipment.)

All lots of delay type Primer Detonators, M14, tested and manufactured by the Arkansas Ordnance Plant in 1945, exceeded specification limits and therefore are considered unserviceable. Eight lots also exceeded the failure rate limit. Four lots of delay type Primer Detonators, M14, manufactured by Picatinny Arsenal (PA) in 1950 and 1955 exceeded specification limits and are considered unserviceable. One lot also exceeded the failure rate limit. Three of the five lots of non-delay Primer Detonators, M14, manufactured by Picatinny Arsenal in 1953 and 1954 exceeded the specification limits and are considered unserviceable. Two of these three lots also exceeded the failure rate limits. One lot PA-26-40 was satisfactory in all respects. The fifth lot CPA-26-14 was satisfactory for the 15 samples tested, however, at least 30 detonators should have been tested before a definite conclusion is made. (Author)

AD-268 190 Div. 22, 17
(TISTM/GEC) OTS price $3.60

Watertown Arsenal Labs., Mass.
MECHANICAL AND METALLURGICAL PROPERTIES OF CARBURIZED 8620H STEEL FOR M14 RIFLE COMPONENTS,
by Joseph L. Sliney. Nov 61, 31p. incl. illus. tables, 4 refs. (Technical rept. no. WAL TR 739.1/3)
Unclassified report

DESCRIPTORS: (*Small arms, Guns.) (*Steel, Carbon compounds, Sulfur compounds, Martensite, Brittle materials, Impurities, Mechanical properties, Hardness, Fatigue (Mechanics), Fracture (Mechanics), Tensile properties, Stresses, Impact shock, Microstructure.) (Manufacturing methods, Processing, Heat treatment.)

Mechanical and metallurgical tests were conducted to aid in the development of improved processes and materials for M14 rifle bolts and receivers being manufactured from carburized 8620H resulphurized steel. The investigation revealed that extreme brittleness can occur in carburized components, especially those having small fillet radii. This brittleness was associated with high core hardness and nonmartensitic microstructures which occurred in AISI 8620H steel over the allowable range of composition. The study demonstrated the importance of close control over the composition and heat treatment of this material and the advantages from a performance standpoint of employing a steel having higher hardenability and lower carbon content. An evaluation of important variables upon fatigue properties of 8620H steel was made. (Author)

AD-268 366 Div. 22
(TISTW/JRG) OTS price $8.60

Carnegie Inst. of Tech., Pittsburgh, Pa.
FUNDAMENTALS OF SHAPED CHARGES.
Quarterly progress rept. no. 24,
by Emerson M. Pugh. 31 Oct 61, 99p. incl. illus. 14 refs.
(Contract DA 36-061-ORD-513, Proj. TB3-0134)
Unclassified report

DESCRIPTORS: (*Steel, *Ammunition fragments, *Hypervelocity projectiles, *Hypervelocity guns, Design, Tests.) (Steel, Ammunition fragments, Hypervelocity projectiles, Terminal ballistics, Penetration, Targets, Sheets, Aluminum alloys, Magnesium alloys, Lead.) (Steel, Ammunition fragments, Hypervelocity projectiles, Velocity, Terminal ballistics, Targets, Sheets, Aluminum alloys, Magnesium alloys, Cratering.) (Targets, Penetration, Cratering, Theory, Volume, Configuration.) (Ballistics, Data, Tables.) *Shaped charges.

Various aspects of the perforation of thin targets by high speed fragments were investigated. A fragment projector yielding compact steel fragments having a velocity of 3.17 km/sec and a mass of .0234 g was generally used for experimental studies. Design features of this projector are presented with methods of attaining higher velocities. The volume and shape of craters produced in lead at 60 degrees obliquity by fragments having a velocity of 4 km/sec are compared with the characteristics of craters produced at impact velocities of 3 km/sec and 5 km/sec. (Author)

AD-268 402 Div. 22, 2
(TISTW/JRG) OTS price $2.60

Army Signal Research and Development Lab., Fort Monmouth, N. J.
ANALYSIS OF BALLISTIC METEOROLOGICAL EFFECTS ON ARTILLERY FIRE,
by Raymond Bellucci. Sep 61, 17p. incl. illus. tables (ASRDL Technical rept. no. 2224)
Unclassified report

DESCRIPTORS: (Howitzers, *Artillery fire, *Ballistics, Errors, *Meteorology.) (Direction finding, Meteorological instruments, Meteorological data, Atmospheric sounding.) Phototheodolites.

The results and conclusions derived from a series of meteorological soundings taken in conjunction with howitzer firings at Fort Sill, Oklahoma, during March and April 1958 are given. The tests provided information for determining the relative importance of ballistic and meteorological sources of error in the artillery system. Estimates are given for the error arising from existing meteorological sounding equipment, space and time variability of meteorological data, and of gunnery and ballistics. (Author)

AD-268 447 Div. 22
(TISTE/NTM) OTS price $1.10

Measurement Systems, Inc., Norwalk, Conn.
QUANTUM DETECTOR FOR MEASUREMENT OF EED BRIDGE WIRE TEMPERATURE RISE.
Monthly progress rept. no. 5, 1-30 Nov 61.
1 Dec 61, 5p. incl. illus. (Rept. no. ER-7030)
(Contract N178-7934)
Unclassified report

DESCRIPTORS: (*Electric detonators, *Electric igniters, *Electric bridges, Electric wire, Electromagnetic fields, Electromagnetic effects, *Temperature warning systems, Hazards, Design.) (*Detectors, Miniature electronic equipment, Optical equipment, Mirrors, Optical images, Test equipment, Effectiveness.)

Research was continued on the construction and testing of experimental vibrating reed choppers, and on the construction of an experimental squib quantum detector. Several choppers were constructed with improved characteristics. The coil and core were reduced in size while increasing the excursion of the reed by a factor of five. A typical chopper is illustrated. The core is made from one iron transformer lamination. A slot was made in the core to fasten the reed. In previous designs the reed was cemented directly to the core. The rigidity of the support was temperature dependent. In the new design, the reed is inserted into the slot. The core is crimped, closing the slot and fastening the reed. Also a better magnetic circuit is obtained by this method. (Author)

AD-268 622 Div. 22, 30
(TISTW/JRG) OTS price $4.60

Rock Island Arsenal, Ill.
DEVELOPMENT OF AN ELECTROMECHANICAL SYSTEM FOR MEASURING ARTILLERY RECOIL DISPLACEMENT AND VELOCITY,
by J. C. Hanson, E. E. Lewis, and A. C. Hanson.
19 July 61, 36p. incl. illus. tables, 2 refs.
(Rept. no. 61-2725)
(DA proj. no. 501-01-034)
Unclassified report

DESCRIPTORS: (*Artillery, *Recoil mechanisms, Instrumentation, Test equipment, Measurement, Velocity, Motion, Guns.) (Analog systems, Transducers, Electronic circuits, Electric bridges, Design, Tests.)

The design, construction and testing of an electromechanical system for obtaining simultaneous analogs of artillery recoil displacement and velocity with conventional recording oscillographs are described. The system consists of a transducer and associated electronic circuitry. The transducer is based on the variable reluctance principle. Displacement is obtained by connecting it electrically as the variable leg in a wheatstone bridge. Velocity is obtained with an electronic circuit based on the resistance-capacitance-differentiator principle. (Author)

AD-268 639 Div. 22, 9
(TISTP/WH) OTS price $2.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
THE BLAST-HYPERSONIC FLOW ANALOGY BASED UPON OSHIMA S QUASI-SIMILARITY MODEL,
by Clark H. Lewis. Dec 61, 21p. incl. illus. tables, 14 refs. (AEDC TN 61-158)
(Contract AF 40(600)800)
Unclassified report

DESCRIPTORS: (*Shock waves, *Detonation waves, Air, Mathematical analysis, Explosions, Numerical methods and procedures.) (*Hypersonic flow, Mathematical analysis, Numerical analysis, Mathematical prediction, Experimental data.) (Pressure, Density, Axially symmetric flow, Mach number.)

The quasi-similarity model of Oshima was applied to the blast-hypersonic flow analogy, and comparisons were made with other blast analogy solutions, real gas characteristic solutions, and experiment. The shock shape is no better predicted by the quasi-similarity model than by other blast analogy solutions. Hemisphere-cylinder surface pressures near the juncture of the nose and afterbody are better predicted by the quasi-similarity model, and the method yields the correct asymptotic value far downstream. The radial density distribution in the shock layer is well predicted over a small region of a hemisphere-cylinder. (Author)

AD-268 654 Div. 22, 9
(TISTP/WH) OTS price $6.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
PLANE, CYLINDRICAL, AND SPHERICAL BLAST WAVES BASED UPON OSHIMA'S QUASI-SIMILARITY MODEL,
by Clark H. Lewis. Dec 61, 67p. incl. illus. tables, 6 refs. (AEDC TN 61-157)
(Contract AF 40(600)800)
Unclassified report

DESCRIPTORS: (*Shock waves, *Detonation waves, Blast, Air, Mathematical analysis, Numerical methods and procedures, Explosions.) (*Hypersonic flow, Mathematical analysis, Numerical analysis, Functions, Tables, Digital computers.)

Numerical solutions are given for plane, cylindrical, and spherical blast waves in air based upon Oshima's quasi-similarity model. New solutions are given for plane and spherical waves in addition to the cylindrical solutions given previously by Oshima. The results for cylindrical flow do not agree with Oshima's results near the core of the explosion. These differences are discussed, and the precision of the present numerical solution is given. The results provide new data for investigating blast waves or the blast-hypersonic analogy. (Author)

AD-268 786 Div. 22, 25
(TISTP/MFA) OTS price $2.60

Stevens Inst. of Tech., Hoboken, N. J.
RESEARCH PROGRAM ON CONVERSION OF EXPLOSIVE ENERGY.
Quarterly progress rept. Apr-June 61,
by S. J. Lukasik. June 61, 16p. incl. illus. tables, 1 ref.
(Contract DA 28-017-501-ORD-3450)
Unclassified report

DESCRIPTORS: (*Shaped charges, *Explosives, Explosions, Electrical conductance, Transmission lines, Measurement, Calibration, *Spectrographic analysis, Thermal radiation, Absorption, Cesium compounds, Potassium compounds, Ionization, Copper.) (Instrumentation, Cameras, Spectrographic cameras.) (Experimental data, Tests, *Photographic analysis.) Research program administration.

Analysis of existing conductivity data was com-

pleted and work on existing experimental programs was continued. The mechanical construction of the capacitor bank was completed and the checkout of its electrical performance began. Over-all ringing measurements and inductance measurements on the various components are underway. (Author)

AD-268 845 Div. 22, 30
(TISTW/DLW) OTS price $1.60

Philco Corp., Willow Grove, Pa.
SUBSYSTEM SS1A (AUTOMATIC DATA PROCESSING SYSTEM FOR FIELD ARTILLERY APPLICATIONS).
Quarterly progress rept. no. 5, 1 July-30 Sep 61, by H. Glazer and F. Ungerman. 30 Sep 61, 14p. incl. Illus.
(Contract DA 36-039-sc-85146)
Unclassified report

DESCRIPTORS: (*Data processing systems, *Fire control computers, Automatic, Artillery, Artillery fire, Programming, Design.) (Combat information centers, Data transmission systems, Display systems, Design, Military training.)

Final testing and debugging of the first deliverable BASICPAC system were nearly completed. Debugging of the second system was initiated. Shelter layout and modification of the GFE shelter was completed for System No. 1 and partially completed for System No. 2. The first phase of the SS1A training program for military personnel was completed and preparations were made for conducting the final phase at Ft. Huachuca. (Author)

AD-268 847 Div. 22, 3
(TISTW/JRG) OTS price $1.60

Ammunition Group, Picatinny Arsenal, Dover, N. J.
STRESS INVESTIGATION OF THE BURSTER CONTAINER FOR THE 155MM M121 VX PROJECTILE,
by Dusan Georgevich and Marcos Robles. June 61, 16p. incl. illus. 6 refs. (Rept. no. 29)
Unclassified report

DESCRIPTORS: (Howitzers, *Chemical projectiles, Explosives, Containers, Failure (Mechanics), Mathematical analysis, Stresses.)

A stress analysis was conducted to determine the metal parts security of the 155mm M121 VX projectile, with close burster container. It was found that the burster container was stressed beyond yield, allowing elongation and buckling. Although the container becomes externally supported by the casing before the elongation is sufficient to cause rupture, the resultant distortion of the explosive filler is considered hazardous and a possible cause of premature detonation. (Author)

AD-268 854 Div. 22
(TISTW/JRG) OTS price $5.60

Whirlpool Corp., Evansville, Ind.
A TEST OF THE MUZZLE BURST FEATURE OF THE MT T369 FUZE AT ZONE 10 CHARGE FROM THE 105mm M2A2E2 HOWITZER USING T388 EXTENDED RANGE (MODIFIED) PROJECTILES.
Special rept. on MT T369 Fuze Test, 105mm Howitzer Application,
by Charles W. Haag and Clarence C. Clarke. 1961, 1v. incl. illus.
(Contract DA 33-008-501-ORD-1800)
Unclassified report

DESCRIPTORS: (Howitzers, *Projectile fuzes, Time delay fuzes for Antipersonnel ammunition Canister projectiles, Fin stabilized ammunition, Tests, Photographic analysis.)

Thirty-four inert T388 projectiles were equipped with T369 fuzes and tested for muzzle burst action at Camp Atterbury, Ind. In addition, tests of the fuze alone were conducted on the bench to determine if the fuze train burned through consistently when initiated by the normal release of the muzzle burst feature firing pin. All rounds were fired at Charge Zone 10. Results of these tests are summarized.

AD-268 891 Div. 22
(TISTP/FR) OTS price $15.50

Aberdeen Proving Ground, Md.
A TEST TO INVESTIGATE VARIOUS FACTORS OF SIGHTING ERROR,
by L. F. Moore. Dec 61, 87p. illus. tables, 4 refs.
(DA Proj. 502-08-006)
Unclassified report

DESCRIPTORS: (*Small arms, *Gun sights, Errors, Tests.) Tables.

Three individuals conducted 10-trial exercises under various sighting conditions, using a sighting-error recorder designed and fabricated at Aberdeen Proving Ground. The effect of the following factors on sighting error was demonstrated: individual, intensity of illumination, atmospheric conditions, target, type of rear sight, diameter of rear-sight aperture, distance between rear sight and eye, type of front sight, diameter of front-sight aperture, distance between front sight and eye, magnification of telescopic sight, firing position, and relationship between sights and stock. It is recommended that these data be considered in marksmanship training and in weapon design, and that further tests be conducted in areas where quantitative data are desired. (Author)

23. PERSONNEL AND TRAINING

AD-268 220 Div. 23, 12
(TISTB/CCH) OTS price $1.60

Air Proving Ground Center, Eglin Air Force Base, Fla.
A PROGRAM FOR A FUNCTIONAL EVALUATION OF THE GAM-83 MELPAR TRAINER,
by Jack A. Adams. Oct 61, 15p. 6 refs.
(APGC TN 61-41)
Unclassified report

DESCRIPTORS: (*Guided missile simulators, *Training devices, Air to surface, Guided missiles.) (Pilots, Training, Achievement tests.)

The Melpar Proficiency Trainer (MPT) is a part-task training device to be used by F-105 pilots for developing and maintaining skills in delivering the GAM-83 air-to-ground missile. The trainer has a visual display for various attack configurations, and cockpit controls directly associated with GAM-83 arming and delivery are operable. In general, other control and display elements of the cockpit are static. A task analysis of the MPT by F-105 pilots experienced in delivery of the GAM-83 is recommended. Two supplementary plans are presented as a means of providing additional information if further testing is considered feasible. It is recommended that the MPT be evaluated in terms of its training potential and not with regard to its usefulness as a proficiency measurement device. Research has shown that part-task trainers yield measures of pilot performance that tend to be spuriously high. In addition to evaluation of the training benefits to be derived, the suitability of the trainer's proficiency measurement devices and its over-all reliability should be investigated. (Author)

AD-268 223 Div. 23
(TISTB/MS) OTS price $2.50

Behavioral Sciences Lab., Aerospace Medical Div., Wright-Patterson Air Force Base, Ohio.
A SURVEY OF AUTO-INSTRUCTION DEVICES.
Rept. for July 60 - Apr 61 on Training, Personnel and Psychological Stress Aspects of Bioastronautics,
by Felix F. Kopstein and Isabel J. Shillestad.
Sep 61, 111p. incl. illus., 39 refs.
(Proj. no. 1710)
(ASD TR 61-414) Unclassified report

DESCRIPTORS: (*Teaching machines, Training, Education, Automatic, Training devices, Specifications, Handbooks.)

The state of the art of auto-instruction and teaching devices and catalogs instructional devices to April 1961 is summarized in the interest of suggesting possible applications to local training or education problems. The first section briefly reviews what auto-instruction is, whether it is an entirely new concept, its practical benefits, auto-instruction terminology, programs and devices, current programming formats, evaluating a program, and discusses prospects for the future of auto-instruction. The second section catalogs and describes all major current auto-instructional devices: Skinner machines, Pressey machines, Crowder technique, self-organizing systems, audio-visual machines, digital computers as teaching machines, and miscellaneous devices. A list of teaching machine patents is appended. (Author)

AD-268 337 Div. 23
(TISTB/MS) OTS price $6.60

Naval Training Device Center, Port Washington, N. Y.
THE RELATIONSHIP BETWEEN THE DIFFICULTY LEVEL AND KIND OF TRACKING PROBLEM AND THE TYPE OF TRACKING AND TYPE OF CONTROL,
by Richard F. D. Heinemann. 9 Oct 61, 52p. incl. illus. tables, 2 refs. (Technical rept. no. NAVTRADEVCEN 342-4)
Unclassified report

DESCRIPTORS: (*Tracking, Control, *Training, *Training devices, Effectiveness, Test methods, Learning, Errors, Analysis of variance.) Human engineering.

Tracking performance was investigated under varied conditions. Performance was compared in terms of control mode, type of tracking, and type and difficulty of problem. Problems were divided into more difficult and less difficult on the basis of empirical evidence. Analysis of the data pointed out (1) the superiority of pursuit to compensatory tracking, and position to rate control; (2) the increase in difficulty for constant rate as compared with variable rate problems; and (3) the evidence of anticipated differences in difficulty levels. Of importance to the development of tracking skills is the progressively increasing influence of interaction between tracking and difficulty. It was further shown that method of tracking and control was a factor only in the more difficult problems. Two different scoring procedures generally yielded similar results, although the relative merit of position and rate control changed with scoring procedures. (Author)

AD-268 443 Div. 23, 22
(TISTW/DLW) OTS price $3.60

Naval Ordnance Lab., Corona, Calif.
RESEARCH AND DEVELOPMENT EFFORT ON AN UNDERWATER SOUND SIGNAL.
Final rept.,
by H. W. Haight, and L. R. Giattino. 15 Nov 61, 32p. incl. illus. 4 refs.
(NAVWEPS rept. no. 7196)
Unclassified report

DESCRIPTORS: (Underwater sound signals, Underwater sound equipment, *Signal generators, Underwater explosions, Hydrostatic fuzes, Time delay fuzes, Parachutes, Design.) (Water entry, Cavitation noise, Reduction.) (Anti-submarine warfare, *Training devices.)

An underwater sound signal that functions at a water depth of 21 ± 4 feet was designed for antisubmarine warfare training exercises. The device incorporates the use of air retardation as a new concept to solve the problem of cavitation at water entry. With air retardation, the velocity of the device can be stabilized to a point at which hydrostatic forces can be successfully applied within the shallow depths specified. In addition to air retardation, other improvements in basic design promise to upgrade the safety, accuracy, and reliability of the device and to make it available for shallow functioning after a 350-knot launching speed. (Author)

AD-268 954 Div. 23
(TISTA/VGW) OTS price $1.60

Civil Aeromedical Research Inst., Oklahoma City, Okla.
PROBLEMS IN AIR TRAFFIC MANAGEMENT: I. LONGITUDINAL PREDICTION OF EFFECTIVENESS OF AIR TRAFFIC

CONTROLLERS,
by David K. Trites. Dec 61, 11p. incl. illus. tables, 3 refs. (Rept. no. 61-1)
Unclassified report

DESCRIPTORS: (*Air traffic controllers, Aptitude tests, Personality tests, Vocational tests, Achievement tests, Effectiveness of Mathematical prediction, Statistical analysis.)

Current (1961) job performance evaluations and medical history data were obtained for 149 of 197 men trained in air traffic control work in 1956. Evaluations of psychological test and biographical data collected at the time they went through training indicate that: (1) Psychological tests can make a useful contribution to screening applicants for air traffic control work; (2) Instructors in the air traffic control school can make exceptionally valid predictions of job performance evaluations some years later; (3) Older trainees tended to receive poorer job performance ratings some years later than did their younger classmates; (4) Medical history information of the kind collected in this study is not predictable by the psychological tests which were used. (Author)

24. PHOTOGRAPHY AND OTHER REPRODUCTION PROCESSES

AD-268 385 Div. 24
(TISTA/VGM) OTS price $3.00

Data Corp., Dayton, Ohio.
ENGINEERING CONSIDERATIONS IN AUTOMATIC EXPOSURE CONTROL,
by Maurice B. Aufderheide and Jack D. Finley.
Sep 61, 149p. incl. illus. tables.
(Contract AF 33(600)36195)
(ASD TR 61-404) Unclassified report

DESCRIPTORS: (Automatic, *Exposure meters, Cameras, Camera shutters, Control systems, Servo systems, Photoelectric cells, Photosensitivity, Photometers, Theory.) (Mathematical analysis for Design of Photographic recording systems.) (Automatic, Control systems, Gun sight cameras, Aerial cameras, Tests.)

Results are presented of theoretical and laboratory studies in the field of automatic exposure control into a document intended for use by the designer of such systems. The automatic exposure equation is developed upon the basis of photometric analysis and each term is examined analytically. Methods are presented for the analysis of film and sensor characteristics and guidelines for the design and evaluation of automatic exposure controls are given. In addition, the results of laboratory analysis of some controls are reported as well as some significant features of an advanced design. A laboratory light source for the analysis of automatic exposure controls was developed and a description of this device is included. The appendix contains a bibliography and list of applicable standards and specifications. (Author)

AD-268 405 Div. 24
(TISTW/EET) OTS price $3.60

Link Div., General Precision, Inc., Palo Alto, Calif.
BALLISTIC CAMERA SYNCHRONIZATION AND CONTROL SYSTEM.
Progress rept. no. 8, 1-30 Nov 61.
15 Dec 61, 27p. incl. illus.
(Contract DA 30-069-ORD-3291)
Unclassified report

DESCRIPTORS: (*Ballistic cameras, *Control systems, Synchronizers, *Camera shutters, Disks, Circuits, Servo systems, Pulse generators, Oscilloscopes, Design, Tests.) (*Cameras, *Data processing systems, *Photographic equipment, *Optical tracking.)

The circuits for the rotating disc shutter opening circuit, the synchronization detector circuit, the resolver servo, and the tape decoding matrix are discussed. The assignment of tape commands is also presented. A diagram of capping shutter timing is included. The present status of the G-4 averaging circuit is discussed. (Author)

25. PHYSICS

AD-268 111 Div. 25, 15
(TISTP/WH) OTS price $1.60

Illinois Inst. of Tech., Urbana.
ON NADAI'S ANALOGY FOR ELASTIC-PLASTIC TORSION,
by Philip G. Hodge, Jr. Nov 61, 10p. illus.
8 refs. (DOMIIT rept. no. 1-13)
(Contract Nonr-140604, Proj. NR 064-429)
Unclassified report

DESCRIPTORS: (*Cylindrical bodies, Rods, Elasticity, Plasticity, Solids, Analysis, Stresses, Loading, Deformation, Fluid flow.) (Differential equations, Mathematical analysis, Theory, Numerical analysis.) (Disks, Membranes, Relaxation time.)

Nadai's soap-film sand-hill analogy for torsion of an elastic-plastic cylinder was used for both experimental and numerical determination of stresses despite the lack of a clear understanding of its limitations. A proof is given that the analogy is always valid for a solid bar. It is shown by a counter example that the analogy is not generally valid for a hollow bar. (Author)

AD-268 121 Div. 25
(TISTP/MFA) OTS price $2.60

Visibility Lab., U. of Calif., San Diego.
THE REDUCTION OF CONTRAST BY ATMOSPHERIC BOIL,
by S. Q. Duntley, W. H. Culver and others.
1 July 58, 19p. illus., 7 refs. (SIO ref. no. 58-35)
(Contract NObs-72092)
Unclassified report

DESCRIPTORS: (*Optics, Light, *Light transmission, Visibility *Atmosphere, Electromagnetic waves, Wave transmission Optical images, Refractive properties, Refractive index.) (Statistical analysis, Statistical distributions, Probability, Transformation (Mathematics), Bessel functions.)

It is shown that the probability of receiving light from an object viewed through a turbulent atmosphere follows a normal Gaussian distribution. Furthermore the root mean square angular deflection of the points of any object will be proportional to the square root of the object-to-observer distance. From relations of the type described in the examples, it is possible to predict the apparent contrast throughout a given scene, provided the inherent contrast distribution, the Optical Air State, and the range of the target is known. The Optical Air State for a given condition at atmosphere can be measured using a telephotometer and a series of long thin black bars of varying widths. (Author)

AD-268 125 Div. 25, 26
(TISTM/EJH) OTS price $2.60

Kansas State U., Manhattan.
THE PREPARATION AND PROPERTIES OF THIN FILMS OF SEMICONDUCTORS,
by E. Brock Dale. 1 Sep 61, 24p. incl. illus. table, 3 refs. (Scientific rept. no. 1)
(Contract AF 19(604)7218)
(AFCRL-947) Unclassified report

DESCRIPTORS: (*Semiconductors, *Semiconducting films, *Thin films, Intermetallic compounds, Indium compounds, Antimonides, Preparation, Heat treatment, Manufacturing methods, Electrical properties, Conductivity, Hall effect, Low temperature research, Temperature.)

InSb films were grown on glass substrates by vacuum evaporation of bulk InSb. The Hall coefficient and conductivity of annealed films were measured as a function of temperature in the range 80 to 500 K. The conductivity of annealed films at room temperature varies from 25 to 1/68 ohm sec, and the Hall coefficient from 0.07 to 770 cc/coulomb. Both n- and p-type films were obtained, and the majority of the p-type specimens did not become n-type at any temperature below the annealing temperature. Only 2 of the films measured have become intrinsic within the accessible temperature range. The Hall mobilities measured lie between 0.5 and 125 sq cm/volt sec. Mobility in all films but one increased with increasing temperature. This behavior is tentatively ascribed to the predominance of impurity scattering. Some inconsistencies between values of the intrinsic carrier concentration calculated from our data and those predicted by the theory of slightly degenerate semiconductors were noted. (Author)

AD-268 148 Div. 25
(TISTP/WH) OTS price $4.60

Microwave Lab., Stanford U., Calif.
INVESTIGATION OF MICROWAVE PROPERTIES OF PLASMAS.
Final rept., 1 Nov 60-31 Jan 61.
Feb 61, 38p. illus. (ML rept. no. 793)
(Contract AF 19(604)5226)
(AFCRL-346) Unclassified report

DESCRIPTORS: (*Plasma physics, Plasma oscillations, Noise, Magnetic fields, Electron beams, Microwave amplifiers, Cesium electron tubes, *Microwaves, *Wave transmission, Harmonic analysis.)

The investigation concerned the microwave properties of plasmas, and in particular, the interaction of plasmas with electromagnetic radiation in the microwave frequency range, the interaction of plasmas with electron beams, and the behavior of plasma as a transmission medium for microwave signals, including the effect of very high-power pulsed microwave signals. Microwave signals and electron beams were used as tools for investigating properties of plasmas, including such things as oscillation and the effects of microwave power in producing ionization. (Author)

AD-268 166 Div. 25, 2
(TISTP/JW) OTS price $1.10

Technical U., Copenhagen (Denmark).
INVESTIGATION OF NATURAL ATMOSPHERIC AUDIO-FREQUENCY ELECTROMAGNETIC SIGNALS (WHISTLER AND CHORUS PHENOMENA) FROM OBSERVING STATIONS AT SALTHOLM, DENMARK, AND GODHAVN, GREENLAND.
Annual summary rept. no. 1, 1 Mar 60-28 Feb 61,
by Jorgen Rybner. 28 Feb 61, 4p.
(Contract AF 61(052)298)
(AFCRL-639) Unclassified report

DESCRIPTORS: (Audiofrequency, *Electromagnetic waves, Denmark, Greenland.) (Signals, *Ionospheric disturbances, Atmospherics.)

Study concerned natural atmospheric audio-frequency electromagnetic signals. Whistlers and related phenomena from observing stations at Saltholm (Copenhagen, Denmark) and at Godhavn (Greenland) were analyzed and correlated with respect to ionospheric and geomagnetic disturbances with the objective of understanding the structure and behavior of the ionosphere from beyond the height of the F-layer maximum to a distance of several earth radii.

AD-268 179 Div. 25, 30
(TISTM/TCG) OTS price $1.10

Sheffield U. (Gt. Brit.).
THE TRIPLET STATE.
Annual summary rept. no. 3 for 1960,
by George Porter. Jan 61, 4p.
(Contract AF 61(052)32)
(AFCRL-678) Unclassified report

DESCRIPTORS: (*Photolysis, *Argon, Nuclear states, Electrons, Sparks, Glow discharges, Light pulses.) (Atomic energy levels, Fluids, Solvates.) (Radioactive decay, Reaction kinetics, Laboratory equipment, Design.)

Contents:
A thorough investigation of the factors controlling the duration of an electronic flash, by E. R. Wooding
Completion of work on energy transfer between triplet states, by F. Wilkinson
Initiation of work on first order radiationless decay of triplet states in solution, by M. Z. Hoffman. (Author)

AD-268 189 Div. 25, 4
(TISTP/JW) OTS price $1.60

Theoretical Chemistry Lab., U. of Wisconsin, Madison.
GROUND STATE POTENTIAL ENERGY OF DIATOMIC MOLECULES,
by Ernest R. Davidson. 17 Nov 61, 9p. 6 refs.
(Rept. no. CM-1005, series no. 3)
(Contract NOrd-15884)
Unclassified report

DESCRIPTORS: (*Molecules, Electron transition, Energy, *Molecular spectroscopy.) (Mathematical analysis, Inequalities, Perturbation theory.)

Identifiers: Diatomic molecules.

The restrictions placed on the ground state potential energy of a diatomic molecule by the inequality $d^2(R^2E)/dR^2$ 0 are discussed. This leads to rather weak smoothness conditions on E(R). (Author)

AD-268 209 Div. 25, 1, 14
(TISTM/GEC) OTS price $3.50

American Machine and Foundry Co., Niles, Ill.
AN INVESTIGATION OF THE MATERIALS AND CONSTRUCTIONS OF TENSION MEMBERS FOR USE IN AIRCRAFT ARRESTMENT EQUIPMENT,
by Donald F. Hausknecht, Richard Kessler, and Michael F. Darienzo. June 61, 201p. incl. illus. tables, 5 refs.
(Contract AF 33(616)7152, Proj. MR 1135-80)
(ASD TN 61-66) Unclassified report

DESCRIPTORS: (Aircraft, *Arresting gear, Materials, Landing impact, Impact shock, Shock resistance, Synthetic fibers, Steel wire, Cordage.) (Mathematical analysis, Test methods, Nylon rope, Glass textiles, Cotton textiles, Silk, Woolen textiles, Tests, Tensile properties, Stresses.)

An analytical investigation and experimental verification of the dependency of the impact tolerance of tension members on their geometrical and material characteristics was made. Tests were conducted to determine the impact tolerance of those tension members which promised superior performance. The work is part of a program dealing with problems of aircraft arrestment at high landing velocities. Test results verify the use of the developed analytical methods in establishing an expected impact tolerance for materials whose mechanical properties are known. The tests indicated that the highest transverse impact tolerances were exhibited by nylon, Fortisan and fiberglass specimens in that order. The strong correlation encountered between the predicted and the test data values for the longitudinal impact tolerance properties of the specimens tested indicate that the highest longitudinal impact tolerance belongs to nylon as predicted. Of the two textile materials tested, Fortisan exhibits the highest value at 234 to 281 knots. (Author)

AD-268 215 Div. 25, 2
(TISTP/MFA) OTS price $5.60

Battelle Memorial Inst., Columbus, Ohio.
SOLID STATE PROPERTIES OF NON-CONDUCTING MATERIALS OF SIMPLE MONATOMIC AND DIATOMIC SPECIES.
Final technical rept., 1 Oct 60-30 Sep 61,
by Laurens Jansens. 15 Nov 61, 52p. incl. illus. tables.
(Contract DA 91-591-EUC-1591)
Unclassified report

DESCRIPTORS: (*Solid state physics, *Crystal structure, Conductivity, Materials, *Crystals, *Molecular structure, Solids, Rare gases, Atoms.) (Physical properties, Perturbation theory, Energy, Statics.) (Harmonic oscillators, Series, Integrals, Statistical analysis, Distribution theory.)

Analysis of crystal structures of heavy rare gases has been made such that the cubic structure becomes more stable if deviations from the assumption of twobody forces are taken into account. Since, in principle, there occur many possible types of such manybody interactions, a systematic analysis of these various effects was undertaken, based on a cluster expansion and making use of a perturbation treatment. Simultaneously, a number of pilot calculations was carried out to acquire better insight in the different characteristics of the various possible manybody effects. From the analysis of spectra from trapped free radicals in molecular crystals it was found that an argon matrix behaves to some extent like a nitrogen matrix. To provide a basis for the explanation of this curious phenomenon, it was shown that the crystal field in solid argon is not simply the sum of fields from separate atoms, but that deviations occur in the form of higher multipole moments induced by electron exchange between neighboring atoms. (Author)

AD-268 221 Div. 25
(TISTP/JW) OTS price $4.60

Space Sciences Lab., General Electric Co.
Philadelphia, Pa.
NUMERICAL INVESTIGATION OF ONE-DIMENSIONAL VISCO-

PLASTIC MODEL.
Quarterly rept. no. 3, 3 May-3 Sep 61,
by T. D. Riney. Oct 61, 34p. incl. illus. tables, 8 refs.
(Contract AF 08(635)1713, Proj. 9860)
(APGC TN 61-43) Unclassified report

DESCRIPTORS: (Plastics, Model tests, *Hypervelocity projectiles, Equations.) (*Impact shock, Velocity, Viscosity, Particles, Stresses.) *Difference equations.

An explicit finite difference formulation of the equations governing the one-dimensional visco-plastic model was programmed on the IBM 7090, and exploratory calculations were made for several values of the parameters U (viscosity factor), T (yield stress) and V (impact velocity). Excellent results are obtained for certain ranges of the parameters; these results are discussed in detail. For larger values of U and V, however, the restriction on the size of increment T is very severe. A stability analysis is performed which explains this requirement. To circumvent this difficulty the governing equations are recast in an implicit finite difference scheme which is only valid for U exceeds 0, but which is then unconditionally stable. The method is described in detail and a flow chart is given for the machine program which is currently being written.

AD-268 225 Div. 25
(TISTP/MFA) OTS price $3.60

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
THERMODYNAMIC PROPERTIES OF NITROGEN FROM 2000 K TO 8000 K,
by C. E. Treanor and J. G. Logan, Jr. Jan 57, 28p. incl. tables, 5 refs. (Rept. no. BE-1007-A-5)
(General Electric Co. Subcontract no. SDP-1001)
Unclassified report

DESCRIPTORS: (*Thermodynamics, *Nitrogen, *High temperature research, Dissociation, Gas ionization.) (Physical properties, Spectrographic data, *Tables.) (Computers, Punched card methods, Programming.)

Tables of thermodynamic properties of nitrogen at high temperatures, including effects of dissociation and ionization are presented. The partition functions, first and second temperature derivatives of partition functions, equilibrium constants and temperature derivatives of equilibrium constants are tabulated at intervals of 500 K between 2000 and 8000 K. The mole fraction composition, temperature and density derivatives of mole fraction composition, pressure, entropy, enthalpy, specific heats and speed of sound are tabulated at the temperatures given above and at densities of 1/1000, 1/100, 11/10, 1 and 10 times standard atmospheric density. All quantities were calculated directly from the formulas of statistical mechanics, using digital computers and employing the most recent spectroscopic data. Effects of the second virial coefficient are not included. (Author)

AD-268 227 Div. 25
(TISTP/TL) OTS price $9.10

Space, Plasma and Radiation Lab., U. of Colorado, Boulder.
OPTICAL BEHAVIOR OF FILMS FOR RADIATION IN THE EXTREME ULTRAVIOLET.
Scientific rept. no. 1, 2 Mar 59-31 Aug 61,
by Thomas T. Cole, F. Oppenheimer, and W. A. Rense. Aug 61, 98p. incl. illus. tables, 46 refs.
(Contract AF 19(604)5533)
(AFCRL-1046) Unclassified report

DESCRIPTORS: (*Metal films, *Optical analysis, *Optics, *Ultraviolet radiation, X rays, Solids, Gases.) (Aluminum, Silver, Gold, Magnesium, Silicon compounds, Monoxides, Metals, *Thin films.) (Instrumentation, Reflectometers, Vacuum systems.) *Snell's law.

The optical properties of many substances in the region of radiation wavelengths less than 2000 A are unknown because experimental difficulties are encountered due to the opacity of most solids and gases in the extreme ultraviolet. The theory of optical constants of absorbing substances from measurements of reflectivity is discussed. The generalized Fresnel equations were used to construct graphs of reflectivity as a function of refractive index and extinction coefficient for four angles of incidence and five values of polarization of the incident light. The specular reflectivity of aluminum, silver, gold, magnesium fluoride, silicon monoxide, and zinc sulfide films was measured for wavelengths of 1216 A, 1048 A, 920 A, 584 A, and 304 A using an ultraviolet monochromator and a vacuum reflectometer. Samples were vacuum evaporated into glass and measured in situ. The transmission of an aluminum film at 584 A and 304 A was also measured. The optical constants of these substances were obtained. (Author)

AD-268 230 Div. 25
(TISTP/MFA) OTS price $4.60

David Taylor Model Basin, Washington, D. C.
AXISYMMETRIC ELASTIC DEFORMATIONS AND STRESSES IN A WEB-STIFFENED SANDWICH CYLINDER UNDER EXTERNAL HYDROSTATIC PRESSURE,
by John G. Pulos. Nov 61, 39p. incl. illus. tables, 8 refs. (Rept. no. 1543)
Unclassified report

DESCRIPTORS: (*Sandwich construction, *Cylindrical bodies, *Deformation, Stresses, Pressure, Elasticity, Load distribution.) (Numerical analysis, Equations, Functions, Computers, Programming.)

A theoretical analysis of axisymmetric elastic deformations and stresses in a web-stiffened sandwich cylindrical shell structure under external hydrostatic pressure is presented. The solution is based on the use of edge coefficients for plate and shell elements of finite length, and includes the computation of edge forces and moments arising at common junctures of these elements. Equations are given for computing numerically the longitudinal and circumferential stresses in the two coaxial cylindrical shells and the radial and tangential stresses in the web stiffeners between the two shells. No consideration was given to the discontinuity effects arising from rigid or elastic restraints afforded by contiguous bulkhead or adjacent shell structures. Thus, the analysis presented is applicable only to a typical bay of a web-stiffened sandwich cylinder of long length. A numerical example is presented to illustrate the use of the equations. (Author)

AD-268 236 Div. 25, 20
(TISTP/WH) OTS price $10.10

General Atomic Div., General Dynamics Corp., San Diego, Calif.
THEORETICAL STUDY OF OPTICAL PROPERTIES.

VOLUME I. PHOTON ABSORPTION COEFFICIENTS, OPACITIES, AND EQUATIONS OF STATE OF LIGHT ELEMENTS, INCLUDING THE EFFECT OF LINES.
Final rept.,
by John C. Stewart and Kedar D. Pyatt, Jr.
Sep 61, 121p. incl. illus. tables, 29 refs.
(Rept. no. GA-2528, vol. 1)
(Contract AF 29(601)2807, Proj. 7811)
(AFSWC TR 61-71, vol. 1)
Unclassified report

DESCRIPTORS: (*Photons, Light, *Absorption, Atoms, Hydrogen, Beryllium, Carbon, Nitrogen, Aluminum, Silicon.) (Thermodynamics, Electrons, Ions, *Transport properties.) (Astrophysics, Plasma physics.) Tables.

Photon absorption coefficients and mean opacities were calculated for H, Be, C, N, Al, and Si over a temperature range from 1.5 to 34 ev and a density range from about 0.1/cc downward. Contributions to the absorption coefficient from free-free (inverse-bremsstrahlung), bound-free (photoelectric), and bound-bound (line-absorption) processes are included, as is Compton scattering. Certain thermodynamic properties are given. An improved recipe for pressure ionization is derived which is approximately valid at nondegenerate densities for any ratio of Debye length to ion-sphere radius. Line absorption is evaluated using recent results from pressure-broadening theory and a representation of line series which is computationally as simple as the statistical method. Results show that lines increase the Rosseland mean opacity by a factor which can be nearly ten and which is insensitive to moderate changes in line widths. (Author)

AD-268 237 Div. 25
(TISTP/WH) OTS price $21.00

General Atomic Div., General Dynamics Corp., San Diego, Calif.
THEORETICAL STUDY OF OPTICAL PROPERTIES. VOLUME II, APPENDIX B. MONOCHROMATIC ABSORPTION COEFFICIENTS FOR HYDROGEN, BERYLLIUM, AND CARBON.
Final rept.,
by John C. Stewart and Kedar D. Pyatt, Jr.
Sep 61, 349p. incl. illus. (Rept. no. GA-2528, vol. 2)
(Contract AF 29(601)2807, Proj. 7811)
(AFSWC TR 61-71, vol. 2) Unclassified report

DESCRIPTORS: (*Absorption, *Optics, Gases, Light, Hydrogen, Carbon.) (Absorption, Optics, Beryllium.)

Plots are presented of the monochromatic absorption coefficient with and without lines. The upper graphs on each page are with lines, and the lower are without. The graphs are grouped by element according to increasing atomic number, for each element grouped according to increasing values of kT equals theta, and for each value of theta grouped according to increasing gamma. Each graph is labeled with the name of the element, the value of gamma and the value of theta in electron volts. (Author)

AD-268 238 Div. 25
(TISTP/WH) OTS price $21.00

General Atomic Div., General Dynamics Corp., San Diego, Calif.
THEORETICAL STUDY OF OPTICAL PROPERTIES. VOLUME III, APPENDIX B. MONOCHROMATIC ABSORPTION COEFFICIENTS FOR NITROGEN, ALUMINUM, AND SILICON.
Final rept.,
by John C. Stewart and Kedar D. Pyatt, Jr.
Sep 61, 1v. incl. illus. (Rept. no. GA-2528, vol. 3)
(Contract AF 29(601)2807, Proj. 7811)
(AFSWC TR 61-71, vol. 3) Unclassified report

DESCRIPTORS: (*Absorption, Light, *Optics, Nitrogen, Aluminum, Silicon.)

Graphs are presented showing plots of the monochromatic absorption coefficient with and without lines. The upper graphs on each page are with lines, and the lower are without. The graphs are grouped by element according to increasing atomic number, for each element grouped according to increasing values of kT equals theta and for each value of theta grouped according to increasing gamma. Each graph is labeled with the name of the element, the value of gamma, and the value of theta in electron volts. (Author)

AD-268 251 Div. 25
(TISTM/EJH) OTS price $3.60

Hammond Metallurgical Lab., Yale U., New Haven, Conn.
SELF DIFFUSION OF SULFUR-35 IN SINGLE CRYSTALS OF LEAD SULFIDE,
by Martin S. Seltzer and J. Bruce Wagner, Jr.
22 Oct 61, 31p. incl. illus. tables, 19 refs.
(Technical rept. no. 3)
(Contract Nonr-60934)
Unclassified report

DESCRIPTORS: (*Sulfur, Radioactive isotopes, Tracer studies, Diffusion, Single crystals, *Lead compounds, *Sulfides, Chemical impurities, Bismuth compounds, Silver compounds, Lattices, Crystal structure, Chemical bonds, Theory, High temperature research.) (*Semiconductors, *Solid state physics.)

The diffusion of radioactive S (S-35) into single crystals of PbS was studied as a function of deviation from stoichiometry and defect concentration introduced by doping, between 773 to 1023 K. Measurements were made using crystals whose composition varied from 3 x 10 to the 18th power excess S atoms per cc to 5 x 10 to the 18th power Pb atoms per cc. The S excess specimens showed the highest diffusivities in this temperature range, whereas lowest diffusion coefficients were obtained in the Pb excess specimens. Diffusion measurements were performed also on specimens doped with 0.5 or 0.05 mole % Ag_2S or Bi_2S_3. Results indicate that the nature of the bonding forces between the components of PbS may be the most important single factor in determining the process by which diffusion occurs in partially polar compounds. (Author)

AD-268 257 Div. 25, 30
(TISTP/WH) OTS price $5.60

Washington Square Coll., New York U., N. Y.
A STUDY OF THE FAR INFRARED PROPERTIES OF CRYSTALS.
Scientific rept. no. 15, 1 Mar-31 May 61,
by J. H. Rohrbaugh. 31 May 61, 49p. incl. tables, 1 refs.
(Contract AF 19(604)2673)
(AFCRL-954) Unclassified report

DESCRIPTORS: (*Crystals, Infrared radiation, *Infrared spectroscopy.) (Crystals, Lattices, Ions, Electrostatic fields.) (Sodium com-

pounds, Chlorides, Lattices, Matrix algebra.) (Tables, Frequency, Quantum mechanics, Electromagnetic waves.) (Crystals, Solid state physics.)

Tables are presented giving the Coulomb terms for each different wave number for the f. c. c. alkali halide crystal for a subdivision of 24 in wave number space. These Coulomb terms are independent of the masses and interionic separation for general use. When the constants appropriate to a particular lattice are used and repulsive terms added, to eigenfrequencies and eigenvectors can be computed from which the optical properties in the far infrared can be obtained. (Author)

AD-268 258 Div. 25, 30
(TISTP/WH) OTS price $3.60

Washington Square Coll., New York U., N. Y.
A STUDY OF THE FAR INFRARED PROPERTIES OF CRYSTALS.
Scientific rept. no. 16, 1 June-31 Aug 61, by J. H. Rohrbaugh. 31 Aug 61, 33p. incl. illus. tables, 4 refs.
(Contract AF 19(604)2673)
(AFCRL-955) Unclassified report

DESCRIPTORS: (*Crystals, Infrared radiation, *Infrared spectroscopy.) (Crystals, *Refractive index, Reflection, Measurement.) (Sodium compounds, Chlorides, Lattices, Matrix algebra.) (Tables, Quantum mechanics, Electromagnetic waves.) (Crystals, Solid state physics.)

A modification of Simon's method is described for determining the complex index of refraction from reflection measurements. Polarization studies involving a model scaled from the infrared to the millimeter wave are reported wherein the diffraction resulting from various strips is obtained experimentally and theoretically. The eigenvalues for a subdivision of 24 in wave vector space are also given for NaCl. (Author)

AD-268 282 Div. 25, 15
(TISTP/MFA) OTS price $1.60

Visibility Lab., U. of Calif., San Diego.
FUNCTIONAL RELATIONS FOR THE R AND T OPERATORS ON PLANE-PARALLEL MEDIA,
by Rudolph W. Preisendorfer. 14 Nov 57, 9p. illus. 2 refs. (SIO ref. no. 57-47)
(Contract NObs-72092, Proj. NS 714-100)
Unclassified report

DESCRIPTORS: (*Optics, Electromagnetic waves, Light transmission, Scattering, Attenuation, *Continuous media.) (*Operators (Mathematics), Partial differential equations, Green's function.)

The case of finite, non-separable plane-parallel media is considered. The study of these media requires not two but four functions: a reflectance-transmittance pair for each of the two boundaries of the medium. The four principles of invariance for a non-separable plane-parallel medium are formulated, and are found to be just sufficient to yield the appropriate integro-differential equations governing the four functions. (Author)

AD-268 283 Div. 25
(TISTP/MFA) OTS price $2.60

Visibility Lab., U. of Calif., San Diego.
RADIANCE DISTRIBUTION AS A FUNCTION OF DEPTH IN THE SUBMARINE ENVIRONMENT.
Amendment 5, Final rept., by John E. Tyler. 28 Mar 58, 28p. incl. illus. tables (SIO ref. no. 58-25)
(Contract NObs-72092, Proj. NS 714-100)
Unclassified report

DESCRIPTORS: (Light, *Light transmission, Underwater, Electromagnetic waves, *Depth finding, Visibility, Barges, Submarines.) (Phototubes, Photometers, Reflection, Refraction.) (Experimental data, Tables, Equations.)

A theoretical treatment of natural underwater light based on isotropic scattering was made. Observations were made on clear sunny days and compared with observations on overcast days. Observations were also made at various depths ant through various color filters. The light field was explored in a vertical plane in the sun's direction and in the vertical plane at right angles to the sun's direction. In addition the light field was explored with azimuth sweeps taken at various zenith angles. It was observed that the angular distribution pattern of the natural light field changed in shape with depth, and it was surmised that at some unknown depth an equilibrium shape might be reached. It was also noted that the direction of the bright spot in the submarine light field tended to approach the zenith as depth was increased. Although the data was adequate for the intended purpose, it does not now lend itself to detailed investigations of the submarine light field or to computation of water constants. (Author)

AD-268 284 Div. 25
(TISTP/MFA) OTS price $2.60

Visibility Lab., U. of Calif., San Diego.
A GENERAL THEORY OF PERTURBED LIGHT FIELDS, WITH APPLICATIONS TO FORWARD SCATTERING EFFECTS IN BEAM TRANSMITTANCE MEASUREMENTS,
by R. W. Preisendorfer. 1 May 58, 19p. illus.
(SIO ref. no. 58-37)
(Contract NObs-72092, Proj. NS 714-100)
Unclassified report

DESCRIPTORS: (Light, *Light transmission, *Scattering, Phototubes, Optical systems, Measurement, Aerosols, Attenuation.) (Perturbation theory, Linear systems, Transformations (Mathematics), Numerical methods and procedures, Integration.) (Experimental data, Tables.)

A general formulation of the equation of transfer for perturbed radiance field in an arbitrary optical medium is presented. The resultant theory is applied to the problem of the measurement of the volume attenuation function in natural waters and the atmosphere. The theory leads to several new measuring techniques which take into account the perturbation effect on the light field of the standard measuring apparatus used for the determination of the functions. In addition, the theory provides a means of estimating the relatively elusive forward scattering value of the volume scattering function. Finally, two criteria are given for estimating the order of magnitude of the forward scattering effects encountered in beam transmittance measurements. (Author)

AD-268 304 Div. 25, 17
(TISTM/GEC) OTS price $2.75

Armour Research Foundation, Chicago, Ill.
MEASUREMENT OF THERMAL PROPERTIES.

Rept. for 5 Feb 59-15 Dec 60 on Materials Application,
by I. B. Fieldhouse and J. I. Lang. July 61, 119p. incl. illus. tables.
(Contract AF 33(616)6324, Proj. 7381)
(WADD TR 60-904) Unclassified report

DESCRIPTORS: (*Metals, *Alloys, *Thermal conductivity, *Enthalpy, *Specific heat, *Thermal expansion, Measurement, Test equipment, Test methods, Tables.) (Stainless steel, Iron alloys, Carbon alloys, Nickel alloys, Copper alloys, Niobium alloys, Titanium alloys, Chromium alloys, Vanadium, Zirconium, Molybdenum compounds, Silicides, Magnesium compounds, Oxides, Hafnium.)

Measurement has been made of the thermal conductivity, specific heat and linear coefficient of thermal expansion of the following materials: Stainless steel type 420, Stainless steel type 17-4 PH, AM 355, Crucible HNM, Ti-C110M, Inco 713C, Haynes Stellite HE 1049, Kennametal K161B, M252, Rene 41, V, Zi, Molybdenum Disilicide, MgO, and Hf. The chemical analysis of these materials is given. Thermal conductivity was determined by using the radial heat flow method. Specific heat was measured by means of the method of mixtures. This resulted in data of enthalpy as a function of temperature. Linear thermal expansion was determined by measuring the distance between two recrystallized alumina pins mounted in a rod of the material to be evaluated which was placed in a constant temperature furnace. (Author)

AD-268 331 Div. 25
(TISTP/MFA) OTS price $1.60

General Dynamics/Convair, San Diego, Calif.
INFRARED EMISSIVITY OF OH,
by W. Malkmus. Sep 61, 9p. incl. illus. 3 refs.
(Rept. no. ZPh-120)
(Contract AF 19(604)5554)
(ARPA Order no. 116) Unclassified report

DESCRIPTORS: (*Infrared radiation, *Hydroxides, Molecules, Gases, Doppler systems.) (Infrared spectroscopy, Analysis, Experimental data.)

An application of the results of diatomic gas emission analysis to the OH molecule is presented. The fundamental band strength of the OH molecule was taken as 1/100 sq. cm./atm. at 300 K. In the absence of experimental data, the factor theta (the ratio of the zeroth to the first order term in the expansion of the electric dipole moment) and the average line width (which enters only in the strong line approximation) were assumed to be the same as for the HF molecule. (Author)

AD-268 332 Div. 25
(TISTP/MFA) OTS price $1.60

General Dynamics/Convair, San Diego, Calif.
INFRARED EMISSIVITY OF DIATOMIC GASES WITH DOPPLER LINE SHAPE,
by W. Malkmus. Sep 61, 15p. incl. illus. 3 refs.
(Rept. no. ZPh-119)
(Contract AF 19(604)5554)
(ARPA Order no. 116) Unclassified report

DESCRIPTORS: (*Infrared radiation, *Gases, Vibration, Rotation, Doppler systems.) (Harmonic oscillators, Series, Infrared spectroscopy, Radiofrequency spectrum analyzers.)

An extension is made of previous analysis of infrared emission of diatomic gases to the case of a Doppler-broadened line shape, which is of particular importance at low pressures and long path lengths. (Author)

AD-268 333 Div. 25, 27
(TISTP/MFA) OTS price $1.60

General Dynamics/Convair, San Diego, Calif.
SOME STUDIES OF THE FLUCTUATIONS IN EMISSION FROM THE EXHAUST GASES OF SMALL ROCKET ENGINES,
by F. C. Harshbarger and M. Dorian. Nov 61, 16p. incl. illus. (Rept. no. ZPh-130; Appendix E to rept. no. ZPh-078, AD-323 010)
(Contract AF 19(604)5554)
(ARPA Order no. 116-60)
Unclassified report

DESCRIPTORS: (*Rocket motors, *Exhaust gases, Infrared radiation, Exhaust nozzles, Noise, Flutter, Gas flow, Tests.) (Instrumentation, Photomultipliers, Oscilloscopes, Amplifiers, Detectors, Band-pass filters.) (Experimental data, Amplitude modulation, Frequency.)

An experimental analysis was made of the frequency spectrum of fluctuations in radiant emission from the exhaust gases of small rocket motors near the nozzle exit. This study was to determine, if possible, an optimum chopping frequency for a device being designed to measure small optical absorption (approximately 1%) in rocket flames. The principle of operation was suggested by Oldenberg. In brief, the apparatus consists of a collimated beam of greybody radiation, chopped by a silvered sector disk so as to produce two sinusoidally modulated beams, 180 degrees out of phase. One beam passes through the flame under study, and the other is used as a reference. Emission from the flame is eliminated by a synchronous amplifier tuned to the chopping frequency. (Author)

AD-268 355 Div. 25
(TISTP/MFA) OTS price $2.60

University of Southern Calif. Engineering Center, Los Angeles.
ON TRANSPORT PROCESSES IN A PLASMA (KINETIC EQUATION FOR A PLASMA).
Technical note,
by Toyoki Koga. Oct 61, 18p. incl. illus. 5 refs. (Rept. no. 83-209)
(Contract AF 49(638)831, Proj. 9783)
(AFOSR-1744) Unclassified report

DESCRIPTORS: (*Plasma physics, *Transport properties, Gas ionization, Kinetic theory, Diffusion, Magnetic fields, Magnetic cores.) (Transformations (Mathematics), Operators (Mathematics), Functions, Partial differential equations.)

Authors usually neglect the effect of Coulomb field in the space of radius e2/(3kT/2) surrounding a charged particle, and derive equations of the Fokker-Planck type from the Liouville equation of a plasma. The effect of the inner core field, neglected usually, is shown to be present in an equation of the Fokker-Planck type as an additional term similar to the collision term in an equation of the Boltzmann type. It is shown that the order of this additional term may easily be larger than those of the friction and diffusion terms, the effect of the outer core field. When the effect of the outer core field is larger than that of the inner core field, the assumption of binary interaction is shown to be not feasible. The possible nonlinear and non-Markovian behavior of a particle is neglected. (Author)

AD-268 369 Div. 25
(TISTP/MFA) OTS price $4.60

Miami U., Coral Gables, Fla.
UNIVERSITY OF MIAMI PLASMA PHYSICS BULLETIN,
by Harry S. Robertson, M. A. Hakeem and others.
Sep 61, 39p. incl. illus. 22 refs.
Unclassified report

DESCRIPTORS: (*Plasma physics, Gas ionization, *Glow discharges, *Transport properties, *Electric arcs, Hysteresis, Magnetic fields.) (Instrumentation, Experimental data.)

This report includes:
MOVING STRIATIONS IN GLOW DISCHARGE PLASMAS,
by H. S. Robertson and M. A. Hakeem. 1961, 13p. incl. illus. 12 refs.

TRANSPORT PROPERTIES IN A ROTATING PLASMA,
by Harry S. Robertson. 1961, 11p. 4 refs.
(Contract AF 19(604)8082)

ARC STUDIES IN A MAGNETIC FIELD, by William B. Pardo and Jack L. Tunstall. 1961, 15p. incl. illus. 6 refs.

AD-268 392 Div. 25
(TISTP/MFA) OTS price $3.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
HEAT TRANSFER TO A METAL SLAB WITH RADIATION BOUNDARY CONDITIONS,
by David C. Stickler. 15 Oct 61, 28p. incl. illus. tables, 3 refs. (Rept. no. 1107-5)
(Contract AF 30(602)2305)
(RADC TR 61-256) Unclassified report

DESCRIPTORS: (Metals, Copper, Stainless steel, Sheets, *Heat transfer, Thermal conductivity, *Thermal diffusion, Thermodynamics.) (Partial differential equations, Nonlinear systems, Integral equations, Numerical analysis, Green's function.) (Experimental data, Tables.)

The plane metal slab problem was treated in a rigorous manner for constant heat input and the 4th degree nonlinear radiation boundary condition at the front surface and an insulated rear surface. This was possible by formulating the problem as a nonlinear Volterra integral equation. An approximate solution was constructed with appropriate error bounds. This technique shows that the solution with the corresponding linear boundary condition yields an accurate solution for a large number of problems of practical interest. Numerical examples including rigorous estimates of their validity are given for several cases. For the case where this approach does not yield sufficiently accurate results, two alternate approaches are suggested. (Author)

AD-268 393 Div. 25, 15
(TISTP/MFA) OTS price $4.60

Electronic Defense Labs., Mountain View, Calif.
ELEMENTARY RESULTS FOR HIGH FREQUENCY SCATTERING BY CONES,
by J. E. Burke, L. Mower, and V. Twersky.
24 Apr 61, 40p. incl. illus. 11 refs. (Engineering rept. no. EDL-E58)
(Contract DA 36-039-sc-87475)
Unclassified report

DESCRIPTORS: (Electromagnetic waves, Electromagnetic fields, *High frequency, *Scattering, Diffraction, Optics, Differential cross section, Reflection, Conical bodies.) (Vector analysis, Geometry, Integrals, Green's function, Bessel functions.)

Elementary high frequency results for scattering by finite cones are obtained by approximating the surface fields in the integral representation by their geometrical optics values. Both singly and doubly truncated cones are considered. A general expression is obtained for the location of the specular beam (i.e., the surface generated by the geometrically reflected rays), and simple results for the field on and off the beam are developed. In particular, it is shown that for many practical purposes a universal curve exists for the scattering pattern. This curve, which depends on a parameter involving the cone's length and half angle, falls more or less between the Fraunhofer aperture patterns for the strip and disk, and differs essentially in that the minima are not zero. Numerical illustrations are given. (Author)

AD-268 410 Div. 25
(TISTP/TL) OTS price $5.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
CHARACTERISTICS OF THE ARC IN A GERDIEN-TYPE PLASMA GENERATOR,
by M. T. Dooley, W. K. McGregor, and L. E. Brewer. Dec 61, 54p. incl. illus. tables, 13 refs. (Rept. no. AEDC TR 61-13)
(Contract AF 40(600)800, Proj. 8951)
Unclassified report

DESCRIPTORS: (*Plasma jets, *Plasma physics, Generators, Electrodes, Circuits, Gases, Heat.) (Density, Gas ionization, Atmospherics, Pressure, Low pressure research, Test equipment, Spectrographic analysis.) (Flames, Orifice, Measurement, High temperature research.) (Gases, Electrical properties, Voltmeters, Oscilloscopes, Ceramic materials, *Electric arcs, Electrodes.)

Characteristics of the arc in a d-c arc plasma generator having a Gerdien-type electrode configuration are described. Emphasis is placed on the jet structure and its influence on the use of this generator as a research, hot gas source. An explanation of the experimental methods used to determine the true arc configuration is included. These methods consisted of probe studies. The investigation was made in a low pressure test cell at atmospheric pressure. Results show that at atmospheric pressure the observed flame exiting from the generator orifice is the envelope of many blown arcs. In the low pressure test cell, the expanded flame is found to be free of these blown arcs; instead the arc is contained in a small section near the orifice exit. (Author)

AD-268 426 Div. 25, 30
(TISTM/GEC) OTS price $2.60

Engineering Supervision Co., New York.
INVESTIGATION OF STRESS DISTRIBUTION AND STRENGTH CHARACTERISTICS OF LOAD MAGNIFICATION ANVILS FOR ULTRA HIGH PRESSURE APPARATUS. Quarterly scientific rept. no. 2, 1 Apr-30 June 61 on Photoelastic Investigation of Axially Compressed Cone Frustums,
by Herbert Becker. 30 June 61, 19p. incl. illus.
(Technical rept. no. SM 61-10)
(Contract AF 19(604)7438; In cooperation with New York U. Coll. of Engineering)
(AFCRL-727) Unclassified report

DESCRIPTORS: (*High pressure research, Laboratory equipment, Installation, Gaskets, Load distribution, Photoelasticity, Stresses, Shear stresses, Pressure, Temperature, Fracture (Mechanics), Tests, Theory.)

Photoelastic studies were made of the stresses induced in conical frustums by uniform pressure applied to the small bases. One cone was investigated for uniform pressure applied to the small base and to a region of the conical surface adjacent to the small base. The data are reported in the form tau sub max/p where tau sub max is the principal shear stress at a point and p is the nominal uniform pressure applied to the cone base (axial force/base area). In addition, a room temperature test was performed on one cone to determine the fracture mode. The experimental method and results of these investigations are described and contain comparison with theory. (Author)

AD-268 427 Div. 25, 30
(TISTM/GEC) OTS price $1.60

Engineering Supervision Co., New York.
INVESTIGATION OF STRESS DISTRIBUTION AND STRENGTH CHARACTERISTICS OF LOAD MAGNIFICATION ANVILS FOR ULTRA HIGH PRESSURE APPARATUS.
Quarterly scientific rept. no. 1, 1 Oct 60-31 Mar 61, 9p. illus. tables.
(Contract AF 19(604)7438)
(AFCRL-728) Unclassified report

DESCRIPTORS: (*High pressure research, Laboratory equipment, Installation, Wedges, Surfaces, Load distribution, Elasticity, Stresses, Shear stresses, Photoelasticity, Pressure, Hydrostatic pressure, Tests, Mathematical analysis.)

An investigation of the elastic stress distribution in load magnification anvils for ultra-high pressure apparatus was made. Results are reported of analytical and photoelastic studies of 2 and 3 dimensional configurations that constitute idealized representations of the load magnification anvil system. (Author)

AD-268 434 Div. 25
(TISTP/MFA) OTS price $1.60

Institute of Optics, U. of Rochester, N. Y.
(No title).
Final rept., 1 Sep 58-31 Aug 61,
by D. L. Dexter and R. M. Blakney. 31 Aug 61, 14p.
(Contract AF 49(638)433)
(AFOSR-1485) Unclassified report

DESCRIPTORS: (*Photoconductivity, *Optics, *Infrared optical systems, Ultraviolet optical materials, *Ultraviolet radiation, Radiometers, Photoemission, Luminescence.) (Crystals, Crystal structure, Lattices, Rubidium compounds, Potassium compounds, Thallium compounds, Iodides, Lead compounds, Sulfides.) (Research program administration, Theses.)

An increased understanding of the processes of optical excitation and energy transfer in insulators and semiconductors, based on experimental studies of absorption, luminescence, photoconductivity, and photo-emission is examined. Emphasis has been placed on those phenomena which are properties of the pure material, or of the simpler kinds of lattice imperfections. (Author)

AD-268 436 Div. 25
(TISTM/GEC) OTS price $10.50

Kentucky Research Foundation, Lexington.
ELECTRICAL, OPTICAL, AND THERMAL PROPERTIES OF THE M_2^{Vb} N_3^{VIb} SEMICONDUCTORS.
Final technical rept. 1 July 58-31 Jan 61,
by Lee Gildart. Oct 61, 129p. incl. illus. tables, 81 refs.
(Contract AF 49(638)90)
(AFOSR TR 60-124) Unclassified report

DESCRIPTORS: (*Semiconductors, Dielectrics, Thin films, Crystals, Single crystals, Crystal structure.) (*Antimony compounds, *Selenides, *Sulfides, *Bismuth compounds, *Oxides.) (Electrical properties, Optics, Thermodynamics, Photoconductivity, Thermal conductivity, Hall effect.) (Test equipment, Spectrophotometers, Voltmeters, Infrared spectrophotometers.) Intermetallic compounds.

Contents:
Electrical and optical properties of Sb_2Se_3 and Sb_2S_3
Semiconducting properties of Bi_2S_3 and Bi_2O_3 (AD-243 169)
Thermoelectric studies of Bi_2S_3, Sb_2Se_3, and Bi_2Te_3
Electrical transient behavior and switching effect in Sb_2S_3
Apparatus for measuring resistivities and Hall coefficients of intermediate-resistance-value samples

AD-268 449 Div. 25
(TISTP/WH) OTS price $1.60

New Mexico State U. of Agriculture, Engineering, and Science, University Park.
THEORETICAL INVESTIGATION OF ELECTRON ORBITS AND BREMSSTRAHLUNG IN A PLASMA.
Technical rept.,
by Otto H. Theimer. Oct 61, 13p. 6 refs.
(Contract N9onr-95307)
Unclassified report

DESCRIPTORS: (*Bremsstrahlung, *Electrons, *Plasma physics, Fourier analysis, Series.)

The emission of low frequency Bremsstrahlung by a plasma is calculated, by classical methods, from a model in which the electrons interact with the plasma as a whole, and not with individual ions. The Fourier expansion of the ion density is employed for calculating the time dependent electrical field at the position of an electron which moves along a straight line, and the Fourier coefficients of the electrical field are used for calculating the Bremsstrahlung spectrum. A coherence length occurs in the final formulas and replaces the cut-off collision parameter of earlier theories. (Author)

AD-268 465 Div. 25
(TISTP/WH) OTS price $11.00

Michigan U. Coll. of Literature, Science, and the Arts, Ann Arbor.
A STUDY OF CYLINDRICAL SHOCK WAVES IN A SECTOR SHOCK TUBE.
Technical rept.,
by A. Cole and O. Laporte. July 61, 132p. incl. illus. tables, 40 refs. (Rept. no. 02539-26-T)
(Contract Nonr-122418)
Unclassified report

DESCRIPTORS: (*Shock waves, *Shock tubes, *Gas flow, Argon, Nitrogen, Sulfur compounds, Fluorides.) (Shock waves, Analysis, Equations.) (Shock tubes, Instrumentation, Schlieren photography.)

Cylindrical shock waves were produced under controlled laboratory conditions in the sector shock tube. With a compression chamber of 6 in. radius, the cylindrical shocks were well-formed if the diaphragm pressure ratio, Z, was 200 or less while the occurrence of distorted shocks increased as Z increased above 200. Schlieren light screens, used as shock wave sensors for time-of-arrival data, failed to operate for very weak shock waves, Z = 4, and for strong shocks in a low density gas, rho = 2 cm Hg. With pressures as low as 1 micron, resistance thermometers have been used as shock-wave sensors for another shock tube in this laboratory. An empirical equation of the form t = to + b rc or r = a(t-to)n was found to fit the data for most of the cylindrical shock waves investigated. Experimental data compared favorably with theoretical results. (Author)

AD-268 470 Div. 25
(TISTM/TCG) OTS price $3.60

Purdue Research Foundation, Lafayette, Ind.
SEMICONDUCTOR RESEARCH.
Final rept , 1 Oct 60-30 Sep 61.
30 Sep 61, 26p. illus. 6 refs. (Rept. no. PRF 2641)
(Contract DA 36-039-sc-87394)
Unclassified report

DESCRIPTORS: (*Semiconductors, Electrical properties, Optics.) (Magnetic properties, Infrared radiation, Gallium compounds, Antimonides, Intermetallic compounds, Photoemission.) (Radiation effects, Silicon, Neutrons, Paramagnetic resonance, Germanium, *Radiation damage.) (*Superconductors, Niobium, Thermal conductivity, Magnetic susceptibility, Transport properties, Specific heat, Cryogenics.) Materials, Low temperature research.

Contents:
Energy band structure of GaSb; Galvanomagnetic measurements on III-V compounds; Electronic transport properties of p-type Ge at low and high electric fields; Anisotropy of hot carriers in Ge; Hot carrier temperature from IR measurements; Recombination radiation in GaSb; Optical behavior of irradiated Si; IR absorption in GaSb; Paramagnetic resonance in neutron irradiated Si; Electron paramagnetic resonance-Si, Ge; Cyclotron resonance; Heat capacity of several superconductors and other solids at low temperature; Superconducting Nb solenoid; Magnetic susceptibility; Impurity conduction in Sb-doped Ge; Transport properties of N-type Ge at low temperatures; Ge resistance thermometers; Piezo-thermal conductivity effect in Ge; Shallow acceptor states in Ge; Recombination of electrons and donors in N-type Ge; Hall coefficient expression in anisotropic crystals; Material preparation.

AD-268 475 Div. 25
(TISTM/TCG) OTS price $2.60

Space Technology Labs., Inc., Los Angeles, Calif.
SOLUTION OF THE LONDON EQUATIONS FOR THIN RECTANGULAR FILMS,
by L. M. Frantz. 28 July 61, 7p. illus. 5 refs. (Rept. no. 9844-0025-RU-000)
Unclassified report

DESCRIPTORS: (*Superconductors, Superconductivity, *Thin films, Mathematical analysis, Mathematical computer data, Equations, Analysis by Digital computers.) (Experimental data, Indium, Tin.)

The results of a digital computer solution of the London equations, as applied to thin superconducting films of rectangular cross section and infinite length, are presented. The physical results are shown and some of them are converted to a form which can be more readily compared with experimental data.

AD-268 476 Div. 25
(TISTE/CRJ) OTS price $2.60

Space Technology Labs., Inc., Los Angeles, Calif.
CURRENT AND MAGNETIC FIELD DISTRIBUTION FOR AN INFINITELY LONG SUPERCONDUCTOR OF RECTANGULAR CROSS-SECTION,
by C. J. Culler. 1 Mar 60, 26p. incl. illus. (Rept. no. 9844-0011-RU-000)
Unclassified report

DESCRIPTORS: (*Superconductors, *Magnetic fields, *Electric currents, Electrical properties, Electromagnetic effects, Numerical analysis, Mathematical analysis.)

Numerical results are presented which give an essentially complete picture of the quantitative manner in which current piles up along the corners of a superconductor. Various cross-sections were chosen varying down to dimensions comparable to the skin depth as the results obtained here (using the local London equation) will later be compared with those to be obtained from the non-local Pippard equation. (Author)

AD-268 504 Div. 25
(TISTP/WH) OTS price $3.60

Selenia, S.p.A., Rome (Italy).
PROPAGATION CHARACTERISTICS OF A MAGNETO-IONIC DUCT,
by Ing. D. Formato and Ing. A. Gilardini.
1 May 61, 39p. illus. 4 refs. (Technical (Scientific) note no. 2)
(Contract AF 61(052)145)
(AFCRL-981) Unclassified report

DESCRIPTORS: (*Plasma physics, *Magnetohydrodynamics, Ions, *Electromagnetic waves, *Electromagnetic theory, Propagation.) (Wave transmission, Waveguides.) Brillouin zones.

The propagation characteristics of a uniform magnets-ionic duct of circular cross-section are determined for frequencies higher than the cyclotron frequency - The ratios: plasma wavelength/free space wavelength and power flowing in the plasma/power flowing outside are evaluated and discussed as a function of the diameter/wavelength ratio and of the plasma permittivity for the propagation of circularly symmetrical modes. The Brillouin diagrams for frequencies higher and lower than the cyclotron frequency are also derived. (Author)

AD-268 506 Div. 25
(TISTP/WH) OTS price $1.60

Selenia, S.p.A., Rome (Italy).
MICROWAVE DETERMINATION OF AFTERGLOW TEMPERATURES AND ELECTRON COLLISION FREQUENCIES IN NITROGEN AND OXYGEN.
Technical summary rept. no. 2,
by Ing. D. Formato and Ing. A. Gilardini.
30 Apr 61, 18p. incl. illus. 7 refs.
(Contract AF 61(052)39)
(AFCRL-984) Unclassified report

DESCRIPTORS: (*Plasma physics, *Microwaves, Attenuation, Nitrogen, Oxygen.) (Plasma physics, Electrons, Ions, Scattering.)

The results of microwave attenuation, phase shift and radiation temperature measurements in the late afterglows of pulsed oxygen discharges of various types are discussed from the point of view of the collision frequency and G-factor determination. A new general theory for the evaluation of the G-factor from the radiation temperature increases under microwave heating conditions is reported. The values computed with this theory in nitrogen are in very good agreement with the previous diffusion measurements by Crompton and Sutton, whereas in oxygen the agreement with the measurements by Healey and Kirkpatrick is much less satisfactory. (Author)

AD-268 515 Div. 25, 15
(TISTP/MFA) OTS price $1.10

Visibility Lab., U. of Calif., San Diego.
THE K-METHOD OF DETERMINING THE PATH FUNCTION,
by R. W. Preisendorfer. 15 May 58, 5p. incl. illus. tables, 4 refs. (SIO reference no. 58-39)
(Contract NObs-72092)
Unclassified report

DESCRIPTORS: (Light, Optics, *Light transmission, *Lakes, Liquids, Visibility, Scattering.) (Operators (Mathematics), Functions, Sampling, Integration.)

A third method of the determination of the path function N of light is introduced. The two methods already extant are the direct method and the operational method. (Author)

AD-268 576 Div. 25, 9
(TISTP/JW) OTS price $8.60

Boeing Co., Seattle, Wash.
THE USE OF ACOUSTIC SCALE MODELS FOR INVESTIGATING NEAR FIELD NOISE OF JET AND ROCKET ENGINES.
Rept. on Dynamic Problems in Flight Vehicles,
by Walter V. Morgan, L. C. Sutherland and Kenneth J. Young. Apr 61, 90p. incl. illus. tables, 47 refs.
(Contract AF 33(616)6834, Proj. 1370)
(WADD TR 61-178) Unclassified report

DESCRIPTORS: (Acoustics, Scale, *Model tests.) (*Noise generators, Measurement, Fluid flow.) (*Exhaust nozzles, Flame arresters, Nozzles, Jet engines.) (*Rocket motor noise, *Jet engine noise, Simulation, Scale, Model tests.)

Analytical and experimental studies have been made to examine the feasibility of using acoustic scale models for near field noise investigations. Analyses show that the important characteristics of noise generation, propagation, and measurement can be scaled. A few deviations from this involve small errors which are negligible in the near field. The most straightforward model duplicates the gas flow parameters of the full scale engine. The validity of such models has been demonstrated by a series of tests for a wide variety of nozzle exit conditions, from turbojet through rocket exhausts, and whether in a free field or in the presence of objects which interfere with the flow, such as shaped nozzles and flame deflectors. It is further determined both analytically and experimentally that models may be simplified without impairing the results of a scaled test. Considerations in simplifying a model include: reduction of the nozzle size; absence or presence of reflecting surfaces; use of fewer than the full scale number of engines; and use of a substitute gas which is different from and at a lower temperature than that in the full scale engine. (Author)

AD-268 577 Div. 25, 30
(TISTM/TCG) OTS price $1.10

Oxford U. (Gt. Brit.).
INVESTIGATION OF THE INFLUENCE OF DEFECTS ON THE HEAT CONDUCTIVITY OF NON-METALLIC CRYSTALS, PARTICULARLY SUBSTITUTED ALUMINIUM OXIDE (Al2O3).
Final technical rept., 1 Aug 60-31 July 61,
by R. Berman. 31 July 61, 4p. incl. illus. 6 refs.
(Contract DA 91-591-EUC-1509)
Unclassified report

DESCRIPTORS: (*Thermal conductivity, *Crystals, Magnetic materials, Laboratory equipment, Design, Measurement, Test methods.) (*Lithium compounds, *Fluorides.) (*Paramagnetic salts, Lanthanum compounds, Cerium compounds, Magnesium compounds, Cobalt compounds, Nitrates.) (Aluminum compounds, Oxides.) (Magnetic properties, Phonons, Conductivity.)

An apparatus was designed in which heat conductivity can be measured over the temperature range 1 to 100 K. The specimen is mounted beneath a large gas thermometer bulb, the temperature of which can be controlled by balancing the heat influx from the surroundings, at liquid air or liquid H temperature, against the cooling effect of contact with H or He boiling off from a reservoir of liquid. An Au/Co vs Cu thermocouple was calibrated and an Au/Fe vs Ag/Au thermocouple will be examined. Super-conducting reversing switches, immersed in liquid He, are included in the thermocouple measuring circuits to eliminate all thermal emf's arising in the leads above 4 K. The apparatus will also measure specimens in a magnetic field up to 15,000 oe. Measurements were made on LiF with different Li-6/Li-7 proportions. In the liquid H range, the conductivity is much higher than that of any of the isotopically less pure specimens, and the value at 30 K agrees with the curve of conductivity vs composition. Measurements made on 2 paramagnetic rare earth double nitrates showed lower conductivities than a diamagnetic crystal. (Author)

AD-268 587 Div. 25, 24
(TISTE/CRJ) OTS price $3.60

Army Engineer Research and Development Labs., Fort Belvoir, Va.
ENERGY-RECORDING MICRODENSITOMETER
by A. B. Hook, L. F. Gillespie, and F. Mastrup.
26 June 61, 25p. incl. illus. 4 refs.
(Research rept. no. 1677-RR)
(Proj. 8F07-11-001-02)
Unclassified report

DESCRIPTORS: (*Optical systems, Optics, Photographic emulsions, *Photographic recording systems, *Density, *Instrumentation, Design, Measurement.) (Optical systems, Electronic circuits, Linear systems, Photomultipliers.)

An inverse densitometric circuit is described which employs the technique of voltage transfer curve translation to provide a direct linear measure of photographic energy profiles. An antilog D scale (reciprocal transmittance scale) linear to + or - 0.05 antilog D units over a basic antilog D range of 12 is obtained. Neutral-density filters are used to compound the basic sensitivity increment and obtain a total light level range in excess of 1 to 1000. An optical system which provides an instrument resolving power of 500 lines/mm is described. (Author)

AD-268 593 Div. 25, 8
(TISTE/CDM) OTS price $2.25

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
RESEARCH ON VARIOUS PHENOMENA FOR THE PERFORMANCE OF CIRCUIT FUNCTIONS.
Rept. for 1 Oct 59-30 Sep 60,
by Edwin J. Scheibner. Mar 61, 92p. incl. illus. 111 refs.
(Contract AF 33(616)6028, Proj. 8-(8-4150))
(WADD TR 61-148) Unclassified report

DESCRIPTORS: (*Solid state physics, Electronics, Scientific research, Magnetic effects, Photoelectric effect, Optics, Thermoelectricity, Phonons.) (Solids, Electromagnetic properties, *Bibliography.) (*Vacuum systems, *Thin films, Vapor plating, Conductors, Dielectrics.) *Microwave networks, Theory.

Contents:
Technical articles
Extraordinary Hall effect
Magneto-optic effects
Magnetic barrier layer effect
Zener effect
High-voltage photovoltaic effect
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Substrate carrier
Substrate temperature control
Accessory equipment
Literature survey

AD-268 615 Div. 25, 30, 8
(TISTM/GEC) OTS price $1.60

Motorola, Inc., Phoenix, Ariz.
RESEARCH AND DEVELOPMENT FOR NON-DENDRITIC RIBBON CRYSTAL GROWTH.
Scientific rept. no. 1. 14 June-14 Sep 61,
by H. W. Norman and M. E. Forney. 14 Sep 61, 6p. illus.
(Contract AF 19(604)8351)
(AFCRL-936) Unclassified report

DESCRIPTORS: (*Semiconductors, Germanium, *Growth, *Single crystals, Thickness, Surface properties, Manufacturing methods.) (*Crystal ovens, Design.)

Apparatus and techniques are being developed for continuous growth of ribbons of single crystal germanium using knife edges to control the shape of the meniscus without the use of twinned seeds or dendrites. The ribbons are to be of uniform thickness and width and have smooth flat surfaces suitable for the manufacture of semiconductor devices. (Author)

AD-268 616 Div. 25
(TISTM/GEC) OTS price $.75

Directorate of Materials and Processes, Aeronautical Systems Div., Wright-Patterson Air Force Base, Ohio.
STUDIES ON IRON WHISKERS OF HIGH AVERAGE STRENGTH GROWN IN A HYDROGEN CONTAMINATED ARGON ATMOSPHERE.
Rept. for Dec 59-Dec 60 on Solid State Research and Properties of Matter,
by J. E. Emrick. June 61, 16p. incl. illus. tables, 7 refs.
(Proj. 7021)
(WADD TN 61-54) Unclassified report

DESCRIPTORS: (Growth of *Single crystals of *Iron in Controlled atmospheres, Argon, Hydrogen, High temperature research, Reduction, Iron compounds, Chlorides.) (Mechanical properties, Tensile properties, Fracture (Mechanics), Surface properties, Microscopy, Electron microscopy.)

The procedures for the growth of iron whiskers from the hydrogen reduction of ferrous chloride in atmospheres of 97% and 0.1% hydrogen are described. The surface conditions and cross-section of these whiskers were determined by light microscopy. These results are presented along with the mechanical properties of iron whiskers as determined by tensile testing at room temperatures. Ion whiskers of high average strength were obtained and tensile tested to establish that studies on high strength whiskers are feasible using present techniques. (Author)

AD-268 658 Div. 25
(TISTP/MFA) OTS price $1.10

Illinois U., Urbana.
FINAL STATE ENHANCEMENT FACTORS,
by J. D. Jackson and G. L. Kane. 1961, 7p. 6 refs.
(Sponsored by Office of Naval Research)
Unclassified report

DESCRIPTORS: (*Quantum statistics, *Relativity theory, Particles, Pions, Protons, Proton cross sections, Scattering.) (Integral equations, Quantum mechanics.)

The enhancement of production cross sections and modification of energy spectra due to attractive interactions between particles in the final state is presented. A general theoretical discussion of the problem within the framework of formal scattering theory was given by Watson (Phys. Rev. 88:1163, 1952). Interest has been received by experiments on double pion production in pion-pion reactions. (Author)

AD-268 666 Div. 25, 30
(TISTM/GEC) OTS price $1.00

Pennsylvania U., Philadelphia.
PHYSICAL PROPERTIES OF INSULATORS MOLECULAR CRYSTALS AND MAGNETIC MATERIALS.
Rept. on Research on Physical Phenomena Affecting the Characteristics of Electronic Components,
by Max E. Caspari. Mar 61, 34p. incl. illus. 21 refs.
(Contract AF 33(616)6640, Proj. 1-(8-4150)
(WADD TN 61-53) Unclassified report

DESCRIPTORS: (*Chlorides, *Potassium compounds, Color centers, Radiation effects, Excitation by X rays, Photoelasticity, Lattices.) (Ionization, Electric fields, Optics, Absorption, Magnetic fields.) (Iodine, Pho-

toconductivity, Low temperature research, Sensitivity.) (Laboratory equipment, Spectrophotometers, Magnetometers.) (Physical properties, *Magnetic materials, *Electric insulation, *Crystals, Molecular structure.)

Research is being carried out on the determination of the physical properties of alkali halides, molecular crystals and magnetic materials. The research on alkali halides involves the creation of point imperfections by weak ionizing radiations. A study of the expansion and F - center concentration in alkali halides induced by x-ray irradiation of relatively weak intensities was made. The ionization of excited F - centers by electric fields was detected by measuring the change in the F - center concentration when additively colored crystals were irradiated in the F band at liquid N temperatures and an electric field was applied simultaneously. These experiments were designed to give information as to whether the ionization could be considered a Zener type tunneling or an impact ionization process. Work on molecular crystals is presented and results on the photoconductivity of I single crystals are reported. The design of a Foner type magnetometer and a torsion anisotropy apparatus is described. (Author)

AD-268 668 Div. 25, 17
(TISTM/TCG) OTS price $8.10

Columbia U., New York.
ORDERING AND DISORDERING PROCESSES IN CU3AU II.
Doctoral thesis. Final technical rept., pt. 1, 22 Jan 58-21 Jan 61,
by William Gross and S. L. Quimby. 10 Nov 61, 78p. incl. illus. tables, 37 refs.
(Contract DA 30-069-ORD-2195)
(AROD rept. no. 1931.1) Unclassified report

DESCRIPTORS: (*Intermetallic compounds, *Copper alloys, *Gold alloys, Metallic crystals, Single crystals, Lattices, Crystal structure, Crystallization, Reaction kinetics, Configuration, Energy, Theory.)

Data are reported which describe both the equilibrium and kinetic change of length with order in a single crystal of Cu3Au. Equilibrium values of the order dependent change in length per unit length with temperature are given for the region 218 to 500 C by combining these data with the lattice parameter values of Feder, Mooney and Nowick (Acta Met. 6:266, 1958). The isothermal variation of length with time following a sudden change in temperature is studied for changes below the critical temperature when the specimen is initially in various states of long-range order as well as for quenches through the critical temperature where there is no initial long-range order. The experimental data are compared with the description of the phenomena offered by various equilibrium and kinetic theories. (Author)

AD-268 671 Div. 25, 2
(TISTP/FR) OTS price $12.00

Bendix Systems Div., Bendix Corp., Ann Arbor, Mich.
THE APPLICATION OF THE SKYSCRAPER AIRBORNE RADIATION MEASURING SYSTEM TO THE MEASUREMENT OF SKY BACKGROUNDS.
Final rept.,
by H. C. Graboske, Jr. and Arnold Prostak.
29 Dec 61, 1v. incl. illus. tables, 65 refs.
(Rept. no. BSR-605)
(Contract AF 19(604)8460, Proj. 4904)
(AFCRL-1078) Unclassified report

DESCRIPTORS: (Radiometers, Spectrophotometers, Airborne, Aircraft, High altitude.) (Sky, Sky brightness, *Infrared radiation, Light, *Ultraviolet radiation, Measurement.) (Atmosphere, *Spectrographic analysis, Infrared radiation, Ultraviolet radiation.)

The present state of sky radiation background measurements, a discussion of the capabilities of the SKYSCRAPER airborne spectroradiometer system, and a recommended program of background measurements to be carried out with this system are presented. The sources of infrared, visible, and near ultra-violet radiation considered are: clouds, atmospheric gases, the sun, stars, the planets, the moon, aurora, terrain and the sea. The SKYSCRAPER system has three spectrometers, covering the wavelength range from 0.3 micron to 15 microns. In addition, two radiometers perform short and long wavelength measurements. This system is installed in a KC-135 aircraft capable of flying at altitudes to 40,000 ft (12.2 km). It has a 20-inch diameter collecting telescope which can be automatically pointed by either a computer or a tracker, or controlled manually. The SKYSCRAPER System is capable of performing a number of measurements of primary interest, including: the spectral radiance of clouds and sky, spectral and radiometric measurements of planets, stars, and aurora, and measurements of atmospheric transmission. (Author)

AD-268 674 Div. 25
(TISTW/RD) OTS price $12.50

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
(No title).
Progress rept. no. 20, 1 Apr-30 Sep 61,
by Ernst Weber. 30 Sep 61, 167p. incl. illus. tables, 4 refs. (Rept. no. R-452.20-61)
(Contract AF 18(600)1505)
Unclassified report

DESCRIPTORS: (Electromagnetic waves, Scattering.) (*Plasma physics, Gas discharges, Electric discharges, Microwave amplifiers, Light.) (Paramagnetic resonance, Thin films, Ferromagnetism.) (Waveguides, Transmission lines, Cavity resonators, Waveguide couplers.) (Control systems, Switching circuits, Human engineering.) *Parametric amplifiers, Plasma physics, Solid state physics, *Microwave networks, Switching circuits, *Control systems.

AD-268 684 Div. 25
(TISTW/EET) OTS price $3.60

Laboratories for Applied Sciences, U. of Chicago, Ill.
AURORAL RADIATIONS IN THE INFRARED,
by Ivan Sellin. Oct 61, 27p. incl. tables, 14 refs. (Rept. no. LAS-TN-199-20, pt. 1)
(Contract SD-71)
Unclassified report

DESCRIPTORS: (Atmosphere, Molecular spectroscopy, Electron transitions, *Infrared radiation, Measurement, Molecules, Particles, Energy, Protons, Electrons, Magnetic fields, *Infrared spectroscopy.) (Infrared radiation from Aurorae.) Tables.

Contents:
Measurements and predictions of airglow and auroral radiation in the near-infrared spectrum
Investigation of the excitation process in auroras
Prediction of integrated intensities of molecular bands
Calculations of auroral radiation

AD-268 695 Div. 25, 27
(TISTA/SEB) OTS price $7.60

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
THE THEORY OF SURFACE IONIZATION AND ITS APPLICATION TO ION PROPULSION.
Master's thesis,
by Donald D. Mueller. Aug 61, 63p. incl. illus. 107 refs. (Rept. no. GA/Phys/61-4)
Unclassified report

DESCRIPTORS: (*Ion rockets, Electric propulsion, Surfaces, *Ionization, Ions, Mathematical analysis, Theory, Adsorption, Electric fields, Test methods.) (Ion sources, Ionization potentials.) *Theses.

Study was made of surface ionization with emphasis on ion propulsion. Consideration was given to the (1) Saha-Langmuir equation; (2) the Patchy surface effect; (3) adsorption in relation to binding, nature of an adsorbed film, formulation of an electrical double layer, and critical temperature for ionization; and (4) electic field effects relating to the Schottky effect and the space charge limitation. Saturated vapor, molecular beam, and porous plug techniques of studying surface ionization are described. Experiments with alkali metals and halides on Pt and W, and of surface ionization on semiconductors were reviewed. The choice of fuel and ionizer, methods of feeding fuel to the ionizer, and the energy efficiency of the ion source were considered with respect to ion propulsion.

AD-268 715 Div. 25
(TISTP/MFA) OTS price $1.10

Technical Operations, Inc., Burlington, Mass.
THE SCATTERING OF RADIATION BY SLABS.
1960, 8p. incl. illus. tables, 3 refs. (Addendum to rept. no. TO-B 61-39, AD-262 362)
(Contract Nby-32190)
Unclassified report

DESCRIPTORS: (Optics, Surface properties, Reflection, Gamma rays, *Compton scattering, Concrete, Albedo.) (Energy, *Photons, Detectors.) (Experimental data, Tables.)

Relationships among the parameters used to describe radiation-scattering properties of surfaces are presented. The general form of the descriptive system was originally obtained by extending the concepts commonly used to describe the optical properties of surfaces to include the energy degradation which occurs when a photon is scattered. In optical theory, this loss of energy is small enough that it can be neglected; in gamma ray scattering, however, it is a primary effect since the measured quantities are usually functions of intensity rather than of number of photons. As an added complication, authors in this field have used different variables with which to express their results, and because the optical concepts are difficult to keep unraveled, it has not always been clear what these variables are. (Author)

AD-268 720 Div. 25
(TISTP/MFA) OTS price $4.60

Syracuse U. Coll. of Engineering, N. Y.
SIDEBAND INTERPRETATION OF OPTICAL INFORMATION AND THE DIFFRACTION PATTERNS OF UNSYMMETRICAL APERTURES,
by Stanford Goldman. 1 Nov 61, 29p. incl. illus. refs. (Rept. no. EE 494-6112TR5)
(Contract Nonr-66910)
Unclassified report

DESCRIPTORS: (*Optics, Optical systems, Monochromatic light, Sidebands, *Light transmission, *Light communication systems, *Phase modulation, Diffraction, Attenuation.) (Schlieren photography, Optical equipment.) (Fourier analysis, Integral transforms, Information theory.)

The pattern of how information in an object through which a coherent beam of light is passed can be transformed into information existing in the focal plane is described. The information in the focal plane can be interpreted as sidebands of a zero frequency carrier. There is a close connection between the sideband interpretation and the sampling theorem of information theory and this connection is derived and discussed. The mathematical methods used in the one dimensional analysis are an application to optics of certain classical methods in modulation and communication theory. In the two dimensional analysis, a more general method of separating functions into symmetrical and antisymmetrical parts is used. This leads to a new general analysis of the diffraction patterns of unsymmetrical apertures. In the course of the analysis a two-dimensional quadrature function is used. The quadrature function in one dimension is the Hilbert transform. (Author)

AD-268 722 Div. 25
(TISTP/MFA) OTS price $1.10

Oregon U., Eugene.
THE MODIFICATION OF THE SHAPE AND POSITIONS OF SPECTRAL LINES BY FOREIGN GASES UNDER WELL-DEFINED CONDITIONS OF HIGH PRESSURE AND HIGH TEMPERATURE.
Final technical rept., 1 Dec 57-30 Aug 61,
by S. Y. Ch'en. Oct 61, 5p. table.
(Contract DA 04-200-ORD-713, Proj. 599-01-004)
(AROD rept. no. 1981:7)
Unclassified report

DESCRIPTORS: (High temperature research, High pressure research, *Gases, Transition elements, Radioactivity, Cesium, Alkali metals, *Spectrographic analysis, Absorption.) (Experimental data, Research program administration.)

The development of a method for determining the oscillator strengths and the transition probabilities from the extrapolation to zero foreign gas pressures of the plots between the integrated line absorption and the relative densities of foreign gases is presented. (Author)

AD-268 723 Div. 25
(TISTP/MFA) OTS price $4.60

Naval Supersonic Lab., Mass. Inst. of Tech., Cambridge.
EXPERIMENTAL EQUILIBRIUM TEMPERATURES ON A CONE AND A HEMISPHERE AT A MACH NUMBER 3.5,
by Lawrence Lorah and Raymond Tourtellot.
June 58, 37p. incl. illus. table, 8 refs.
(Wind tunnel rept no. 323)
(Contract Nonr-184140)
Unclassified report

DESCRIPTORS: (Wind tunnel models, Conical bodies, Spheres, *Chemical equilibrium, *Thermodynamics, Temperature, Missile windows, Heat transfer.) (*Aerodynamic configurations, Laminar boundary layer, Supersonics.) (Experimental data, Tables.)

A wind tunnel program is described, in which the equilibrium temperature distributions were measured on an 18.5 degrees half-angle cone and on a hemisphere. The tests were run at a nominal free stream Mach number of 3.5 and at stagnation temperatures up to approximately 1200R. The Reynolds numbers, band slant height, were approximately 10,000. The results are compared to the theoretically predicted temperature distributions based on the methods of Lighthill and Crocco. The effects of accounting for radiation heat transfer and heat conduction in the theoretical predictions are shown. (Author)

AD-268 728 Div. 25, 8
(TISTP/JW) OTS price $9.10

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
INVESTIGATIONS ON GUIDING AND RADIATING MICROWAVE STRUCTURES.
Final rept.,
by Arthur A. Oliner. 23 Aug 61, 84p. incl. illus. 42 refs. (Rept. no. PIBMRI-934-61)
(Contract AF 19(604)2031)
(AFCRL-773) Unclassified report

DESCRIPTORS: (*Microwaves, *Antennas, *Waveguides, Transmission lines.) (Electromagnetic waves, Electromagnetic fields, Propagation, Antenna radiation patterns.) (Ferrites, Printed circuits, Plasma physics.)

Contents:
Leaky waves on radiating structures
Strip transmission lines
Trough waveguides
Selected mode and diffraction studies
Ferrite-loaded waveguides
Measurement techniques for two-port structures
Guiding and scattering by sinusoidally-modulated structures

AD-268 747 Div. 25
(TISTP/TL) OTS price $6.60

Purdue U. School of Aeronautical and Engineering Sciences, Lafayette, Ind.
ON THE FOUNDATIONS OF ELECTROELASTOSTATICS,
by A. Cemal Eringen. Nov 61, 63p. incl. illus., 21 refs. (Technical rept. no. 19)
(Contract Nonr-110002)
Unclassified report

DESCRIPTORS: (Electrostatics, Elasticity, Electricity, Magnetism, *Piezoelectric effects, Electromagnetic fields.) (Dielectrics, Solids, Electrostatic fields, Materials, Electromagnetic theory, Deformation.) (Electromagnetic theory, Solids, Piezoelectric materials.)

The Maxwell-Faraday theory of electrostatics is formulated in such a manner as to pave the way for a formulation of the electrostatics of deformable bodies. A variational principle is introduced leading to the basic field equations, the boundary conditions and the constitutive equations of an elastic dielectric subject to large deformations and polarizations. Various forms of the constitutive equations for the stress and the local electric field are proposed. For isotropic dielectrics, specific forms are obtained. The resultant equations are applied to the uniform extension of an internally charged hollow circular cylinder. An approximation to the constitutive equations is found for small strain and polarization. (Author)

AD-268 752 Div. 25, 30, 17
(TISTM/REB) OTS price $3.60

Naval Radiological Defense Lab., San Francisco, Calif.
A FLASH METHOD FOR DETERMINING THERMAL DIFFUSIVITY OVER A WIDE TEMPERATURE RANGE.
Rept. for 1 Jan 59-1 Jan 60, on the Chemistry and Physics of Materials,
by R. J. Jenkins and W. J. Parker. June 61, 29p. incl. illus. tables, 6 refs.
(Proj. no. 7360)
(WADD TR 61-95) Unclassified report

DESCRIPTORS: (*Thermal diffusion, *Thermal conductivity, Test methods, Metals, Alloys.) (Copper, Silver, Iron, Nickel, Aluminum, Tin, Zinc, Stainless steel.)

A flash method of measuring the thermal diffusivity, heat capacity, and thermal conductivity is described. A high intensity short duration light pulse is absorbed in the front surface of a thermally insulated specimen a few millimeters thick coated with camphor black, and the resulting temperature history of the rear surface is measured by a thermocouple and recorded with an oscilloscope and camera. The thermal diffusivity is determined by the shape of the temperature versus time curve at the rear surface; the heat capacity by the maximum temperature indicated by the thermocouple; and the thermal conductivity by the product of the heat capacity, thermal diffusivity, and the density. These 3 thermal properties are determined for Cu, Ag, Fe, Ni, Al, Sn, Zn, and some alloys at 20 and 135 C and compared with previously reported values. Thermal diffusivity data are also reported for 12 different types of stainless steel over the temperature range from 20 to 1000 C. (Author)

AD-268 763 Div. 25, 9
(TISTP/GRW) OTS price $3.60

Ballistic Research Labs., Aberdeen Proving Ground, Md.
QUALITATIVE ASPECTS OF THE MOTION OF RIGID BODIES WITH LIQUID-FILLED TOROIDAL CAVITIES,
by J. H. Giese. Sep 61, 42p. incl. illus. 4 refs.
(BRL rept. no. 1143)
(Proj. 503-06-002)
Unclassified report

DESCRIPTORS: (Liquids, *Bodies of revolution, Stability.) (Motion, Rotation, Dynamics, Hemispherical shells, Ellipsoids, Partial differential equations.)

For a rigid body subject to no moments, the integral curves of the differential equations for the angular velocity are intersections of the energy and angular momentum ellipsoids, which have common centers and principal axes. If the solid contains a cavity that is topologically equivalent to the interior of a sphere completely filled with non-viscous incompressible fluid, these properties remain valid. But if the cavity is topologically equivalent to the interior of a torus, the fluid may have a non-vanishing circulation, A. The angular velocity integral curves are still intersections of ellipsoids, but one of the centers was displaced through a distance that depends on A. If A is 0 there are four types of closed integral curves; five for weak circulation; three for intermediate (A1); and one for strong (A). The qualitative nature of the integral curves for cavities of greater topological complexity is closely akin to that for toroidal cavities.

AD-268 772 Div. 25
(TISTP/MFA) OTS price $1.60

Technische Hoschule, Hannover (Germany).
THE COUPLING MECHANISMS BETWEEN LONGITUDINAL AND TRANSVERSAL WAVES IN A PLASMA,
by G. Burkhardt, Ch. Fahl, and R. W. Larenz.
1 Mar 61, 13p. 8 refs.
(Contract AF 61(052)161)
(AFCRL-735) Unclassified report

DESCRIPTORS: (Plasma physics, *Plasma oscillations, *Cosmic rays, Extraterrestrial radio waves, Radiofrequency, *Electromagnetic waves, Magnetohydrodynamics, Space charges.) (Transformations (Mathematics), Perturbation theory, Partial differential equations.)

Since electron plasma oscillations are assumed to cause nonthermal cosmical radiofrequency radiation, the problem of coupling between longitudinal and transversal plasma waves becomes important. Starting from the basic plasma equations all possible coupling mechanisms are deduced in a general way. Besides the hitherto known mechanisms as the effect of a pressure gradient, of an external magnetic field, and of a general flow of drift field, a new nonlinear ''internal coupling'' effect which is able to generate electromagnetic radiation proves to be existent. Finally some remarks concerning the relativistic aspect of the problem are added, as errors are found in the literature. (Author)

AD-268 777 Div. 25, 8
(TISTP/MFA) OTS price $9.10

Washington U., Seattle. Coll. of Engineering.
PROPAGATION IN BOUNDED ANISOTROPIC MEDIA,
by Lawrence J. Vanden Bos and Gedalia Held.
Oct 61, 102p. incl. illus., 11 refs.
(Technical rept. no. 51)
(Contract AF 19(604)4098)
(AFCRL-718) Unclassified report

DESCRIPTORS: (*Electromagnetic waves, *Wave transmission, *Wave guides.) (Electric fields, Magnetic fields, Ferroelectricity, Plasma physics, Dielectrics.) (Operators (Mathematics), Partial differential equations, Transformations (Mathematics), Series, Differential equations.)

The equations, in rectangular co-ordinates, describing the electromagnetic field configuration in a wave guide filled with a lossless homogeneous anisotropic material are presented. The anisotropic material which completely fills the wave guide is general in the sense that it is anisotropic with respect to both the permittivity and permeability but the anisotropy is restricted to the transverse plane. The solutions of these equations for an infinite parallel plane configuration are presented and the model configuration is discussed. The modal amplitudes in the anisotropic guide when excitation is accomplished by a single incident mode in an isotropic guide and the radiation from the open end for a single and two mode guide is also discussed. (Author)

AD-268 781 Div. 25, 17, 4
(TISTM/GEC) OTS price $1.75

RCA Labs. Div., Radio Corp. of America, Princeton, N. J.
SUPERCONDUCTIVITY IN METALS AND ALLOYS.
Rept. for 15 May 59-15 Nov 60, on Applied Research in Electrical, Electronic and Magnetic Materials,
by W. H. Cherry, G. D. Cody and others. June 61, 53p. incl. illus. tables, 46 refs.
(Contract AF 33(616)6405, Proj. 7371)
(WADD TR 60-919) Unclassified report

DESCRIPTORS: (*Superconductors, Low temperature research, *Superconductivity, Surface properties, Magnetic fields, Thermal conductivity, *Metals, Lanthanum compounds, Hydrogen compounds, Deuterated compounds, Niobium alloys, Tantalum alloys, Vanadium alloys, Tin alloys, Zirconium alloys, Gold alloys, Rhenium alloys, *Alloys.) (Growth, Metallic crystals.) Phase studies, Transition temperature, Resistance.

Methods were developed for the measurement of the interphase energy in superconductors. The method and preliminary results on thin foils and films of tin are reported. A proposed examination of the thermal contact resistance between metals and liquid He is described. The apparatus is designed to measure changes in this contact resistance at the superconducting transition as well as in the normal state. Measurements of the effect of H and deuterium on the superconducting transition temperature of La revealed that they both depressed the transition temperature. Measurements were made of the transition temperatures in the system (Nb, Ta, V)3Sn. The transition temperatures range from 2.8 to 18 K and were related to a simple mass and volume dependence. Critical field measurements indicate behavior similar to that in other hard superconductors. Resistance measurements revealed a resistance anomaly near 100 K which can be related to an existing theory. (Author)

AD-268 799 Div. 25, 27
(TISTA/LSK) OTS price $11.00

Autonetics, Downey, Calif.
THE LITERATURE OF PLASMA JET: THEORY AND APPLICATION FOR ATTITUDE CONTROL AND PROPULSION SYSTEMS,
by Barbara Ann Bryce. 22 Nov 61, 1v. (Rept. no. EM-7516)
Unclassified report

DESCRIPTORS: (*Plasma jets, Plasma physics, Magnetohydrodynamics, Space flight, Control systems, Ion rockets, Electric propulsion, Theory.) *Bibliography.

The literature of plasma jet as referenced in this bibliography of 461 references, concerns the theory and experiments of plasma jets for attitude control of spacecraft and advanced propulsion systems (non-combustion power). Most of the annotated references have been searched from current periodicals, 1960-1961. The six major sections, alphabetically referenced, include: Journals; ASTIA Reports; OTS and Library of Congress Reports; Theses, Patents, and Papers; Meetings; and Books. The bibliography introduction includes information in reference to computer translation of Russian articles on plasma physics. An author index and combined source and corporate index follow the references. (Author)

AD-268 834 Div. 25, 15
(TISTP/MFA) OTS price $1.10

Naval Research Lab., Washington, D. C.
THE MUTUAL RADIATION IMPEDANCE OF CIRCULAR RINGS

ON OBLATE SPHEROIDAL BAFFLES.
Interim rept.,
by S. Hanish. 15 Nov 61, 8p. 2 refs. (NRL rept. no. 5691)
Unclassified report

DESCRIPTORS: (Radiators, Sound, *Acoustics, *Sound transmission, *Transducers, Acoustic impedance, Rings, Sheets.) (Metamathematics, Transformations (Mathematics), Bessel functions.)

A pulsating circular ring of short axial length radiating sound from its exterior surface is idealized to be equivalent to an equatorial zone in a flat oblate spheroidal baffle. The velocity potential of such a zone is studied in detail. Two such zonal radiators are fixed upon a common axis coinciding with the axis of revolution. Formulas for the mutual radiation impedance coefficient between these rings in the absence of scattering are derived and discussions upon them are made. Numerical calculations are however not included because of the complexity of the derived equations. (Author)

AD-268 837 Div. 25
(TISTP/MFA) OTS price $1.60

Naval Research Lab., Washington, D. C.
THE MECHANICAL IMPEDANCE ADDED TO THE WALLS OF A CAVITY RESONATOR BY THE INSIDE AND OUTSIDE LIQUID MEDIUM.
Interim rept.,
by S. Hanish. 5 Dec 61, 9p. 3 refs. (NRL rept. no. 5710)
Unclassified report

DESCRIPTORS: (*Cavity resonators, Sound, Transducers, Underwater sound equipment, Liquids.) (Mechanical properties, *Acoustic impedance, Hydrodynamics, Pressure, Viscosity.) (Partial differential equations, Vector analysis, Integration.)

The boundary-value problem corresponding to the idealized model of the soft-bottom, unidirectional, squirter-type underwater sound generator of length L, and radius a is formulated by prescribing a terminal radiation impedance and then seeking the cavity proportions needed to yield maximum volume velocity. For a prescribed squirter wall velocity a formula for the axial velocity is derived in terms of this terminal impedance. The axial velocity is maximized by selecting ka less than 3.83, and a/L equals 2/pi times the ratio of the speed of sound in the equirter wall material to the speed of sound of the liquid in the cavity. Comparison of these formulas with experimental data is left for a later report. (Author)

AD-268 868 Div. 25
(TISTP/WH) OTS price $2.60

Foreign Tech., Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
APPLIED MATHEMATICS AND MECHANICS (SELECTED ARTICLES).
11 Dec 61, 20p. incl. illus. 12 refs. (Trans. no. FTD-TT-61-228 of Prikladnaya Matematika i Mekhanika 24:845-850 and 965-968, 1961)
Unclassified report

DESCRIPTORS: (Liquids, Acceleration, *Magnetohydrodynamics, *Magnetic fields, Electromagnetic fields.) USSR.

AD-268 869 Div. 25
(TISTP/WH) OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
EXPERIMENTAL DETERMINATION OF THE EFFECTIVE COEFFICIENT OF HEAT CONDUCTIVITY AND DIFFUSION FOR BODIES WITH CHANNEL POROSITY, USING THE METHOD OF ELECTRICAL ANALOGY,
by G. Ye. Morozov. 11 Dec 61, 5p. incl. illus. (Trans. no. FTD-TT-61-111 of Inzhenerno-Fizicheskiy Zhurnal 4:103-105, 1961)
Unclassified report

DESCRIPTORS: (*Heat transfer, *Thermal conductivity, Simulation, Electricity.) (*Analog system, Electricity.) USSR.

AD-268 908 Div. 25, 15
(TISTP/MFA) OTS price $1.60

David Taylor Model Basin, Washington, D. C.
A FORTRAN PROGRAM FOR CALCULATING THE SOUND RADIATION FROM PROLATE SPHEROIDS,
by George Chertock. Nov 61, 11p. 3 refs. (Rept. no. 1562)
Unclassified report

DESCRIPTORS: (*Sound, *Sound transmission, Velocity, Vibration, Measurement.) (Mathematical analysis, Programming, Wave analysis, Polynomials, Functions.)

A program is described which computes the far-field sound pressure levels in the (00) to (05) spheroidal wave modes due to the simultaneous action of one to three velocity distributions with arbitrary phase on the spheroidal surface, and combines the results to give the net sound pressure levels at distant points on the polar axis and on an equatorial axis. The method, input data, and output data are described in detail. (Author)

AD-268 932 Div. 25
(TISTE/CRJ) OTS price $3.60

Philco Corp., Blue Bell, Pa.
ELECTROQUENCHABLE PHOSPHOR INVESTIGATION.
Final development rept., 29 Feb 60-28 Oct 61. 28 Dec 61, 30p. incl. illus. tables (Rept. no. 9005-F)
(Contract NObsr-81189, Proj. SR-0080302)
Unclassified report

DESCRIPTORS: (*Phosphors, *Phosphorescence, Luminescence, Brightness, Measurement, Zinc compounds, Cadmium compounds, Sulfides.) (Display systems, *Cathode ray tube screens, Films, Phosphorescent materials.)

Research was devoted to the investigation of electrophotoluminescent effects in phosphors and the development of techniques leading to the utilization of these effects in useful display devices. It is shown that efficient electroquenchable (EQ) cells can be made, using evaporated phosphor films and solid contacts. The phosphor films themselves have a very high photoluminescent efficiency, and may have future use as high resolution screens in cathode-ray tubes, etc. Very high efficiencies, as far as quenching is concerned, were measured. The theoretical current required for complete quenching of a phosphor having 10 ft-Lamberts of

brightness is 7.5 microampere per sq cm if the phosphor is 100% efficient. Current corresponding to approximately 100 microampere sq cm was measured on some cells. The switching speed of these cells can be high. Switching speeds were measured by controlling a cell with a 60-ohm-per-square-wave voltage. The cells measured were completely quenched in less than 20 microseconds, and reached their full brightness in less than 20 microseconds after the quenching voltage was removed. (Author)

AD-268 933 Div. 25
(TISTP/FR) OTS price $2.60

Naval Research Lab., Washington, D. C.
EXPERIMENTAL FACILITIES FOR THE MEASUREMENT OF ACOUSTICAL WAVES IN WATER.
Interim rept.,
by W. G. Neubauer. 26 Oct 61, 18p. incl. illus. tables, 7 refs. (NRL rept. no. 5688)
Unclassified report

DESCRIPTORS: (*Underwater sound equipment, Underwater sound generators, *Acoustics, Piezoelectric transducers, Hydrophones, Water tanks, Tests.)

A wooden tank (10 ft x 5 ft x 5 ft) filled with water was used for acoustical experimentation. Clean, nonturbid water, maintained by chlorination, is required since objects in the tank, such as acoustical sources and receivers, are located precisely by optical means. Sine-wave pulses between 60 kc and 1 Mc are used. An acoustical source constructed of a piezo-ceramic spherical cap generates an acoustical pressure field as high as 22,000 dynes/sq. cm. at 230 kc at a distance of one meter. This pressure field is sensed by miniature hydrophones with piezo-ceramic disc elements as small as 0.062 in. in diameter by 0.009 in. The ceramic is enclosed by metal to overcome problems encountered previously with waterproof coatings that were incapable of keeping water from e ceramic for long periods of immersion. Pressure sensitivity of the probe hydrophone with preamplifier (49.6-db gain) is 10.3 x 10 to the 6th power volts per dyne/sq. cm. at 230 kc. (Author)

AD-268 934 Div. 25
(TISTE/CRJ) OTS price $1.60

Naval Research Lab., Washington, D. C.
ON THE RADIATION IMPEDANCE OF UNDERWATER CAVITY-TYPE SQUIRTING TRANSDUCERS,
Interim rept.,
by S. Hanish. 21 Nov 61, 10p. incl. illus. 7 refs. (NRL rept. no. 5709)
Unclassified report

DESCRIPTORS: (*Underwater sound generators, *Cavity resonators, *Transducers, Impedance, Mathematical analysis, Theory.)

The tin-walled ring cavity with soft bottom which constitutes a squirter-type underwater sound generator is replaced by a geometrical model consisting of an acoustically hard oblate spheroid with an axial cylindrical cavity, the bottom of which is pressure released. The boundary value problems for the existence of acoustic waves in the interior and in the exterior of the spheroid are separately considered and the 2 solutions are made equal at the surface joining the 2 regions. The result is an infinite set of linear simultaneous equations in an infinite number of unknowns, the unknowns being the expansion constants of infinite series whose sums are the pressure (or particle velocity) at the squirter face. Numerical solutions are, however, not attempted. A general discussion of the results is given. (Author)

AD-268 952 Div. 25, 4
(TISTM/REB) OTS price $1.10

Western Ontario U. (Canada).
THE STRUCTURE OF MERCURY METHYL MERCAPTIDE,
by D. C. Bradley and N. R. Kunchur. 16 Dec 61, 2p. illus. (Technical rept. no. 1)
(Contract Nonr-332500, Proj. NR 052-426)
Unclassified report

DESCRIPTORS: (*Mercury compounds, Methyl radicals, *Thiols, Crystal structure.)

Mercury methyl mercaptide, Hg(SMe)2, prepared from the reaction involving mercuric nitrate and methyl mercaptan, was purified by crystallization from EtOH. Rotation and Weissenberg photographs, using Cu K sub alpha radiation, of the orthorhombic crystals gave the following unit-cell dimensions: a equals 19.80 + or - 0.05; b equals 7.58 + or - 0.05; c equals 7.80 + or - 0.05 angstroms. From the density (3.34 g/cc) it follows that there are 8 formula units per unit cell. By means of systematic absences the space group was uniquely determined as Pbca. The intensity data of (h01), (hk0) and (h11) were obtained using the multifilm technique with a Weissenberg camera (Cu K sub alpha radiation). The intensities of all reflections were estimated visually and the usual correction of scale factors applied. The structure was solved from the (001) and (010) projections. The coordinates of the Hg atoms were obtained by the Patterson synthesis and the (001) and (010) Fourier projections were computed by taking the signs given by the positions of the Hg atoms. (Author)

AD-268 983 Div. 25
(TISTP/JW) OTS price $3.60

Army Signal Research and Development Lab., Fort Monmouth, N. J.
FREQUENCY DOUBLING USING FERRITE SLABS, PARTICULARLY PLANAR FERRITES,
by Isidore Bady. Sep 61, 30p. incl. illus. tables, 11 refs. (ASRDL Technical rept. no. 2217)
Unclassified report

DESCRIPTORS: (*Ferrites, Surfaces, Wave transmission.) (Nuclear spins, *Dielectric properties.) (Frequency multipliers, Conversion ratio, *Dipole moments.) (Electromagnetic waves, Propagation.) Magnetism.

An analysis is given of results of frequency-doubling experiments using relatively thick ferrite slabs. The primary frequency was 9100 megacycles. Dielectric properties of the ferrite caused the double frequency wave to behave as a surface wave. This tends to concentrate the double frequency fields in the vicinity of the ferrite, thus increasing its interaction with the oscillating magnetic dipole moments that generate these fields and increasing the conversion efficiency. The surface-wave effect also causes a phase difference between the magnetic dipole moments and the double frequency fields; this limits the efficiency obtainable through this effect. Spin-wave effects can contribute to harmonic generation if the precession orbits of their magnetization vectors are highly elliptical. The best conversion efficiency obtained in these experiments was -11.1 db at a peak input power level of 6300 watts. Planar ferrites have inherent advantages over isotropic ferrites because the planar anisotropy greatly increases the ellipticity of the precession of the magnetization vectors of both the uniform mode and the spin waves. The relatively large dielectric constant of planar ferrites is also helpful to frequency doubling. (Author)

Division 26-PRODUCTION AND MANAGEMENT

AD-268 990 Div. 25
(TISTP/JW) OTS price $2.60

Johns Hopkins U., Baltimore, Md.
AN EXPERIMENTAL STUDY OF THE HEAT GENERATED DURING TORSIONAL OSCILLATIONS,
by Oscar W. Dillon, Jr. Dec 61, 14p. illus. 5 refs. (Technical note no. 2)
(Contract AF 49(638)1031)
(AFOSR-1824) Unclassified report

DESCRIPTORS: (Oscillation, Aluminum, *Cylindrical bodies.) (Mechanical devices, *Stresses.) (Aluminum, *Torque, Heat, Heat production.) (Mechanical properties, Aluminum, Stresses.)

The heat generated during torsional oscillations of round aluminum tubes is reported. Static mechanical data for the material are also presented and a correlation of mechanical and thermal energies is obtained. The experiments demonstrate the necessity of including a coupling effect between the temperature field and the deviatoric components of strain. (Author)

AD-268 991 Div. 25, 15, 30, 7
(TISTP/JW) OTS price $1.10

Ministry of Aviation (Gt. Brit.).
THE SOLUTION OF AN AXIALLY SYMMETRICAL PROBLEM OF THE THEORY OF ELASTICITY BY THE METHOD OF ELECTRO-MODELLING IN THE CASE OF THE ACTION OF CENTRIFUGAL FORCES AND TEMPERATURE FIELDS (K Resheniyu Osesimmetrichnoi Zadachi Teorii Uprugosti Metodom Elektromodelirovanya V Sluchae Deistviya Tsentrobezhnykh Sil I Temperaturnykh Polei),
by A. L. Kvitka, V. A. Agarev, and E. S. Umanskii. Dec 61, 6p. illus. (Trans. no. TIL/T 5242 of Izv. Kievsk. Politekhn, Inta 19:455-461, USSR, 1956)
Unclassified report

DESCRIPTORS: (Rotating structures, *Stresses, Centrifugal fields, Temperature, Thermal stresses, Determination.) (*Electrical networks, *Analog computers.) (Stress, Mathematical analysis.) USSR.

26. PRODUCTION AND MANAGEMENT

AD-268 311 Div. 26, 17, 27
(TISTM/GEC) OTS price $.75

Battelle Memorial Inst., Columbus, Ohio.
FABRICATION OF TUNGSTEN FOR SOLID-PROPELLANT ROCKET NOZZLES,
by R. I. Jaffee, D. J. Maykuth, and V. D. Barth. 2 Nov 61, 27p. incl. illus. tables.
(DMIC memo. no. 136)
Unclassified report

DESCRIPTORS: (*Rocket motor nozzles, Solid rocket propellants, *Powder metallurgy, *Tungsten, Tungsten alloys, Graphite, Molybdenum, Sheets.) (Manufacturing methods, Forging, Hydrostatic pressure, Sintering, Casting, Melting, Electron beams, Plasma jets, Vapor plating, Extrusion, Deformation, Explosive forming, Welding, Brazing, Machining, Chemical milling, Electrolytic polishing.)

The problem in solid-propellant rocket motors of suitable materials for the throats of nozzles was studied. The maximum heat flux and maximum erosive attack in the motor system occur here. Of the refractory materials available, W and graphite have proven to be the best for nozzles subject to the most severe environments. W has much better erosion resistance and is preferred for multiple nozzle motors where erosion rate is critical and where throats are moderately small. The metal-fabrication industry has recently acquired experience in preparing massive tungsten shapes and sheet in sizes large enough for rocket- nozzle construction. Work on the fabrication of W by forging melted as well as pressed and sintered materials is reported. The performance of nozzle inserts has been related to the specific fabrication processes used in consolidating the metal into massive form. The consolidation and fabrication processes being used to produce large tungsten shapes and sheet, the general physical characteristics of the various types of tungsten being shaped into rocket nozzles, and the performance of these in solid-fuel rocket motors are reported. (Author)

AD-268 554 Div. 26, 17
(TISTM/EJH) OTS price $8.60

Western Gear Corp., Lynwood, Calif.
HIGH ENERGY RATE FORGING DEVELOPMENT.
Interim technical progress rept. no. 2, 3 Apr-10 Dec 61,
by J. M. Palsulich, R. Johann, and R. Hall. 10 Dec 61, 1v. incl. illus. tables, 5 refs.
(Rept. no. 6112-203)
(AMC TR 7-866, vol. 2) Unclassified report

DESCRIPTORS: (*Machine tools, Industrial equipment, Metals, Refractory materials, Heat resistant alloys, Alloys, *Forging, Dies, Precision finishing, High temperature research.) (Airframes, *Steel, *Titanium alloys, Mechanical properties, Tensile properties, Microstructure.)

The suitability of the high energy rate forging machine (Dynapak) to produce high quality forgings from various alloys was investigated. Ti 6Al-4V demonstrates improved ductility when forged above the beta-transus with high energy rate forging equipment. This is desirable due to the ease of forging in this high temperature area over the normal forging temperatures. Large amounts of deformation can be sustained without danger of cracking H-11, 4340 and Ti-6Al-4V. The mechanical properties of the former 2 alloys are not greatly affected by forging temperatures. Net-size forgings are easily produced when compared to other types of forging epuipment. Surface finish of 100 rms can be held when forging non-scaling alloys or when atmospheric protection is provided while the billets are heated to forging temperatures. The fatigue life should be even better than that obtained with conventional forgings. (Author)

AD-268 606 Div. 26, 1, 17
(TISTA/VGW) OTS price $1.60

Lodge and Shipley Co., Cincinnati, Ohio.
MAGNESIUM ALLOY AIRFRAME.
Monthly progress rept. no. 9, 1-31 Oct 61,
by J. A. Warnken and Wm. H. Busch. 13 Nov 61, 17p. incl. illus. tables.
(Contract DA 33-008-ORD-2084, Proj. TN2-8106)
Unclassified report

DESCRIPTORS: (*Airframes, *Magnesium alloys, Hydroforming, Processing, Manufacturing methods, Templates, Machining of Conical bodies, Configuration.)

AD-268 649 Div. 26, 17
(TISTM/EJH) OTS price $4.60

Aluminum Co. of America, Pittsburgh, Pa.
INVESTIGATION TOWARD OBTAINING SIGNIFICANTLY HIGHER MECHANICAL PROPERTIES OF AS-WELDED JOINTS IN HIGH-STRENGTH, HEAT TREATABLE ALUMINUM ALLOYS.
Phase rept. no. 1,
by F. R. Collins. 6 Sep 61, 41p. incl. illus. tables, 5 refs. (Rept. no. 2-61-44)
(Contract DA 36-034-ORD-3237, Proj. TB4-005)
Unclassified report

DESCRIPTORS: (*Aluminum alloys, Copper alloys, Sheets, *Arc welding.) (*Welded joints, *Arc welds, Heat treatment, Aging, Tensile properties, Mechanical properties, Test methods, Test equipment, Corrosion, Microstructure, Stresses.) (Welding rods, Aluminum alloys, Magnesium alloys, Zinc alloys.) Rocket cases.

Welding techniques, filler metal-parent metal selection and moderate temperature post-weld thermal treatments to achieve tensile strengths up to 72,000 psi in welded heat treatable Al alloy sheet are discussed. The Al-Zn-Mg-Cu alloys 7075 and 7178 welded with Al-Mg or Al-Mg-Zn filler metals gave higher as-welded strengths than the Al-Cu alloys 2219 and 2014. The 7075 and 7178 showed excellent response to post-weld aging when welded in either -W or -T6 tempers. Tensile strengths of 70-72,000 psi were achieved in 1/8-in. 7178-T6 sheet welded with Al-Mg-Zn filler metal. Welds in 7075-T6 attained about 68,000 psi tensile strength when post-weld aged 168 hrs at 212 F. Both tensile and bulge strengths were about 15,000 psi higher for post-weld aged than for as-welded joints. Direct current, straight polarity W inert gas welding with He gave the most consistently high strengths. (Author)

AD-268 659 Div. 26, 30
(TISTE/CRJ) OTS price $6.60

International Business Machines Corp., San Jose, Calif.
ADAPT. A SYSTEM FOR THE AUTOMATIC PROGRAMMING OF NUMERICALLY CONTROLLED MACHINE TOOLS ON SMALL COMPUTERS.
Final rept. on Phase 1, 17 July-19 Dec 61.
19 Dec 61, 65p. incl. illus.
(Contract AF 33(600)43365)
Unclassified report

DESCRIPTORS: (*Machine tools, Control, Automatic, Automation.) (*Digital computers, *Machine translation, *Data processing systems, Programming.)

The ADAPT system is an automatic programming system for numerically controlled machine tools. Its language is English-like and problem-oriented. It is compatible with the APT language, with minor exceptions necessitated by the class of computers for which ADAPT is designed. The ADAPT computer program is devised to realize the full potential of a small computer. In the ADAPT language, points, straight lines, circles, ellipses, and general conics in 2-dimensional space can be specified. Commands for tool movements and control are included. To increase the flexibility of the language, nested definitions, FORTRAN-type expressions, and MACRO instructions are allowed. Curve fitting, inclined planes, and pocketing of polygonal enclosures are included to extend the applicability of ADAPT. The ADAPT computer program is comprised of 3 phases: translation, arithmetic, and post-processor. The program is modularized so that sections or subroutines may be deleted, replaced, or added by a user as he desires. (Author)

AD-268 757 Div. 26, 27
(TISTM/GEC) OTS price $6.60

Rocketdyne, Canoga Park, Calif.
MANDRELS FOR FILAMENT WINDING.
Interim technical engineering rept., 5 July-9 Nov 61,
by M. Varlas. 9 Nov 61, 56p. incl. illus. 18 refs. (Rept. no. R-3338-1)
(Contract AF 33(600)43594)
(AMC TR 7-880a, vol. 1)
unclassified report

DESCRIPTORS: (*Rocket cases, *Filament wound construction, Solid rocket propellants.) (Salts, Carbohydrates, Alloys, Pneumatic devices, Metals, Plastics, Foams, Resins, Laminates.) (Tests, Mechanical properties, Tensile properties.) (Manufacturing methods, Processing, Design, Stability, Costs.) *Bibliography.

A summary is presented of current state-of-the-art practices used in the fabrication of mandrels for filament winding, with emphasis on pressure-vessel applications. Inorganic salts and low-melting alloys are often used as material systems in mandrels for filament-winding pressure vessels of smaller diameters. The inorganic salts do not exhibit good dimensional stability at elevated temperatures when used for large-sized mandrels, and the low-melting-point metal alloys are too heavy. Because of requirements of strength and rigidity, combinations of mandrel systems consisting of plaster on collapsible, segmented, metal sections or plasterboard bulkheads are used in the filament winding of rocket motor cases 54 in. in diameter. (Author)

AD-268 770 Div. 26, 17
(TISTM/REB) OTS price $5.60

Thompson Ramo Wooldridge, Inc., Cleveland, Ohio.
TUNGSTEN FORGING DEVELOPMENT PROGRAM.
Interim technical progress rept. no. 5, 9 Aug-9 Nov 61,
by F. N. Lake. 9 Nov 61, 54p. incl. illus. tables (Rept. no. ER-4616)
(Contract AF 33(600)41629)
(AFSC TR 7-797, vol. 5) Unclassified report

DESCRIPTORS: (*Tungsten, *Tungsten alloys, *Forging.) (Manufacturing methods, Extrusion, Melting, Electric arcs.) (Transition temperature, Mechanical properties, Stresses, Rupture, Creep, High temperature research.)

The commercial forging process developed for complex structural W-15%Mo forgings was verified through a production run resulting in an exceptionally high yield of sound universal forgings. Of 32 sound starting billets, 31 were forged successfully through the 3-step sequence utilizing conventional heating and forging equipment. Precision tolerances of + or - 0.015 in. for length, width, and thickness were maintained throughout the production run with only 1 set of commercial die steel tooling for each operation in the sequence. Ductile/brittle transition tests demonstrated the low longitudinal and transverse transition temperatures achieved in the W-15%Mo forged by the process. Stress rupture and creep properties for the forged material at 3000, 3250, 3500, and 3750 F are also reported. (Author)

AD-268 830 Div. 26, 17
(TISTM/EJH) OTS price $1.10

Massachusetts Inst. of Tech., Cambridge.
JOINING OF REFRACTORY METALS - TUNGSTEN.
Quarterly rept., 30 June-30 Sep 61,
by P. Kovach and J. Wulff. 30 Sep 61, 8p. 7 refs.
(Contract DA 19-020-ORD-5236, Proj. TB4-004)
(WAL TR 460.54/1-1)
Unclassified report

DESCRIPTORS: (*Metal joints, *Refractory materials, *Tungsten, Bonding, *Brazing, Crystallization, *Spot welding, Spot welds, Heat treatment, Mechanical properties, Tensile properties, Fracture (Mechanics).) (Soldering alloys, Electroplating, Metal films, Nickel, Palladium.) (Chemical impurities, Thorium compounds, Dioxides.)

Lap joints of commercially pure and 1% thoria doped .005 inch W strip were made using Ni or Pd as filler metals. Satisfactory joints were indicated by the fact that in a room temperature bend test the fracture path passed through the joint rather than along it. Lap joints of similar W strip were made by spot welding using Ni or Pd as filler metals. Heat treatment of these joints, after spot welding, results in an increase in joint strength. (Author)

AD-268 864 Div. 26
(TISTW/DLW) OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
A STUDY OF PNEUMATIC AND HYDRAULIC SERVOMECHANISMS,
by V. N. Chelomey. 14 Dec 61, 16p. incl. illus. 2 refs. (Trans. no. FTD-TT-61-107 of Avtomaticheskoye Upravleniye i Vychislitel'naya Tekhnika, Moscow, pp. 166-181, 1958)
Unclassified report

DESCRIPTORS: (*Pneumatic servomechanisms, *Hydraulic servomechanisms, Servomechanisms, Servo systems, Control systems, Pressure, Differential equations, Partial differential equations, Mathematical analysis.) USSR.

Questions are examined in the theory of pneumatic and hydraulic servomechanisms, with valve distribution, used as steering mechanisms. Block diagrams of both types of machines are presented to make a comparative analysis. (Author)

AD-268 920 Div. 26, 15
(TISTB/MS) OTS price $2.60

Applied Mathematics and Statistics Labs., Stanford U . Calif.
OPTIMAL ADVERTISING POLICY UNDER DYNAMIC CONDITIONS,
by Marc Nerlove and Kenneth J. Arrow. 11 Dec 61, 26p. incl. table, 11 refs. (Technical rept. no. 102)
(Contract Nonr-22550, Proj. NR-047-004)
Unclassified report

DESCRIPTORS: (*Management engineering, *Public relations, *Costs, *Mathematical analysis, *Mathematical predictions, *Applied mathematics.)

Optimal advertising and price policies are derived for the individual firm under conditions of imperfect competition. The model is simplified in the sense that it allows jump policies, which imply an infinite rate of current advertising expenditure, in the initial period. It has the advantage of considering contraction as well as expansion policies. When no factors operate to shift the demand function independently of the firm's actions, the optimal price and advertising policies are shown to be stationary after a certain point. The concept of good will, a stock related to the flow of current advertising expenditures, is introduced. Analysis of the special case in which demand is linear in logarithms and total cost is linear leads to more specific conclusions. We show that the optimal stationary solution implies a constant ratio of advertising to sales. Even in the nonstationary case, in which other factors operate to shift the demand function, the same result is obtained when these factors are assumed to change at a constant proportional rate. This result is supported by some evidence on the actual behavior of firms. (Author)

AD-268 978 Div. 26, 17
(TISTM/REB) OTS price $1.10

Battelle Memorial Inst., Columbus, Ohio.
INVESTIGATION OF HYDROSTATIC EXTRUSION.
Interim technical engineering rept. no. 2, 1 Sep-30 Nov 61,
by R. J. Fiorentino, A. M. Sabroff, and F. W. Boulger. Dec 61, 4p. 4 refs.
(Contract AF 33(600)43328, Proj. 7-916)
(ASD TR 61-7-916, pt. 2)
Unclassified report

DESCRIPTORS: (*Extrusion, Hydrostatic pressure, Feasibility studies, *Machine tools, Hydraulic presses, Design.) (Steel, Titanium alloys, Aluminum alloys, Vanadium alloys.)

Detail design and stress analysis of the proposed tooling is nearing completion. The tooling is being designed for use in a 700-ton vertical hydraulic press. Below the bottom platen of the press is a die-cushion hydraulic assembly which has a hold-down force capacity of 100 tons. This will be used to stabilize the container while under pressure and perhaps contribute to sealing of the die as well. The 200-ton lifting force capacity of the die-cushion will be used for ejecting billets and dies from the liner. (Author)

27. PROPULSION SYSTEMS

AD-268 305 Div. 27
(TISTA/LSK) OTS price $2.60

Bureau of Naval Weapons, Navy Dept., Washington, D. C.
DETERMINATION OF ENGINE CONDITION BY SPECTROGRAPHIC ANALYSIS OF ENGINE OIL SAMPLES.
Progress rept.,
by Jack F. Witten and Bernard B. Bond. 5 Apr 61, 23p. incl. illus.
Unclassified report

Presented to SAE National Aeronautic Meeting, April 5, 1961.

DESCRIPTORS: *Airplane engines, Maintenance by Spectrographic analysis of *Airplane engine oils for Metals, Contamination.

AD-268 320 Div. 27, 14, 12
(TISTM/GEC) OTS price $1.10

Goodrich, B. F., Co., Akron, Ohio.
AFT-END CLOSURE STUDY FOR POLARIS A-3 ROCKET MOTOR CASE.
Monthly progress rept. no. 3, 26 July-26 Aug 61, by H. W. Stevenson and R. A. Harrington.
27 Nov 61, 8p. incl. illus. tables.
(Contract NOw-61-0499-c, Proj. 627-33)
Unclassified report

DESCRIPTORS: (*Rocket cases, Solid rocket propellants, Combustion chambers, Filament wound construction, Design.) (Tests, Model tests, Hydrostatic pressure, Reinforcing materials, Mathematical analysis, Stresses, Shear stresses, Tensile properties, Glass textiles, Laminates, Aluminum alloys, Structural shells, Bonding.) (Synthetic rubber, Epoxy resins, Rubber adhesives, Metal plastic adhesives, Metal glass adhesives.) (Guided missiles, Underwater to surface, Surface to surface.)

Testing of shear test specimens for determining the optimum adhesive bond between Al cluster fitting and fiberglass chamber was continued. Hydrostatic testing of the fabricated sub-scale chambers was conducted. Studies of the factors and theory involved in the bond stress were made. (Author)

AD-268 330 Div. 27, 26, 17, 12
(TISTA/SEB) OTS price $2.60

Lyon, Inc., Detroit, Mich.
DEVELOPMENT OF DEEP DRAWN - ONE PIECE HIGH PERFORMANCE ROCKET MOTOR CASE.
General rept. no. 11, 10 Aug-10 Sep 61.
10 Sep 61, 5p. illus.
(Contract DA 20-018-ORD-23004)
Unclassified report

DESCRIPTORS: (*Rocket motors, Solid rocket propellants, *Rocket cases, Manufacturing methods, Forging, Casting, Drawing (Machine processing), Tools, Dies.) (Steel, Nickel alloys, Titanium alloys, Hardening, Deformation, Microstructure.)

Fabrication of the assemblies for the hot cup die, and the first and second draw dies is reported. A chilled casting method was selected for the third draw die. The die will be made to the same rigid requirements of those associated with the roll manufacture. Competitive bids for the fourth, fifth and sixth die assemblies were obtained. Metallographic examination photographs of 20 to 25% Ni alloys and all beta Ti alloys are presented to illustrate the strain hardening characteristics of the alloys. No evidence of micro-cracks were found in any samples.

AD-268 508 Div. 27, 17, 30
(TISTA/SEB) OTS price $1.10

Stanford Research Inst., Menlo Park, Calif.
TUNGSTEN AND ROCKET MOTORS.
Progress rept. no. 18 for period ending 30 Nov 61,
by Gerald M. Gordon. 15 Dec 61, 3p. incl. table.
(Contract NOrd-18619)
Unclassified report

DESCRIPTORS: (Rocket motors, Solid rocket propellants, *Rocket motor nozzles, *Tungsten, Erosion, Thermal stresses, Shock, Tests, Mathematical analysis, Theory.) (Erosion, Plasma jets, Carbon dioxide, Exhaust gases, Simulation.) (Stresses, Thermal stresses, Strain gages, Test methods, Test equipment.)

The study of tungsten in solid propellant rocket motors involves 2 areas of work; the erosion behavior of W under exhaust conditions; and the thermal shock characteristics of W under nozzle heat-up conditions. The plasma jet apparatus was used to determine whether CO2 would erode W at temperatures near the melting point of W. Appreciable erosion occurred and the W weight loss was about 300 to 400 mg compared with a negligible weight loss for the A1203 runs reported earlier (AD-266 664). The preliminary runs suggest that mechanical erosion in itself is not likely to be significant and that some chemical reaction with W will probably be required for significant erosion to occur. Work progressed on strain measurement instrumentation for determining (as a function of time) the outside surface strain on the W ring thermal shock specimens. Both electrical and mechanical strain gages are being investigated.

AD-268 588 Div. 27, 30
(TISTP/MFA) OTS price $4.60

Army Engineer Research and Development Labs., Fort Belvoir, Va.
FILTER ACCEPTANCE TESTING AND PARTICLE GENERATION STUDY,
by Don R. Taylor. 15 Aug 61, 42p. incl. illus. tables, 8 refs.
Unclassified report

DESCRIPTORS: (*Particulate filters, *Tests, Particles, Counting methods, Sampling.) (*Test equipment, Stainless steel, Steel tubing, Noses.) (Numerical analysis, Effectiveness, Probability, Reliability.) (Pneumatic systems, Particulate filters.)

Methods are presented for performing nondestructive acceptance testing on the particulate matter filter (part of the Pershing missile primary power station pneumatic system). The possibility is investigated of particle generation and passage in the hose which transfers high pressure air from the power station to the missile. Two filter test methods were investigated. One was the particle count method in which the actual particles of system contaminant are sampled from the system and counted to determine if the filter is acceptable. The other was the bubble point method in which the amount of pressure needed to force a fluid through the filter element pores is correlated to the maximum particle size which can pass through the pores. The conclusions derived from the study are: (1) The particle count method cannot be successfully used to test the particulate matter filter due to variables inherent in the method. (2) The bubble point method can be used to test the particulate matter filter. (3) Particle generation and passage through the flexible hose is erratic. The particles are small in number and range in size up to 2500 microns. (Author)

AD-268 626 Div. 27
(TISTW/EET) OTS price $7.60

Space Technology Labs., Inc., Los Angeles, Calif.
STATISTICAL ANALYSIS OF PERFORMANCE FOR TWO-STAGE BIPROPELLANT MISSILES,
by J. E. Brooks, N. E. Friedmann, and E. M. Scheuer. May 60, 72p. incl. illus. 19 refs.
(Rept. no. STL TR-60-0000-09109)
Unclassified report

DESCRIPTORS: (Guided missiles, Surface to surface, Staging, *Rocket propulsion.) (*Liquid rocket propellants, *Fuel consumption, Mathematical prediction, Numerical methods and procedures, Statistical analysis.) (Guided missiles, Surface to surface, Targets, Range, Fuel consumption, Mathematical prediction.)

For a two-stage bipropellant missile, derivations are presented of mathematical equations pertinent to the statistical determination of system performance. Applications considered include: (1) Distribution of propellant depletion time; (2) Distribution of residual propellant; (3) Distribution of maximum range; and (4) Optimum propellant loading. Results obtained are developed in a format suitable for digital computer solution and several numerical examples are presented. (Author)

AD-268 644 Div. 27, 1
(TISTA/VGW) OTS price $3.60

Air Force Flight Test Center, Edwards Air Force Base, Calif.
LIMITED FLIGHT TEST EVALUATION OF A C-82A AIRCRAFT WITH THE JET PAK 1600.
Final rept.,
by James L. Wendland and Carl S. Cross. Nov 61, 25p. incl. illus. 4 refs. (FTC-TDR-61-58)
Unclassified report

DESCRIPTORS: (Transport planes, Jatos, *Turbojet engines, Auxiliary power plants, Flight testing, Effectiveness for Aerodynamics.)

Results are presented of an AFFTC limited flight evaluation of a modified C-82A aircraft. Modifications consist primarily of: the installation of the Jet Pak 1600 (J30 turbojet engine) on top of the fuselage for auxiliary power; the installation of anti-detonation injection (ADI) to the R-2800-85 reciprocating engines for additional 300 horsepower per engine at sea level; and a modification of the rudder to include a servo control tab to decrease the rudder force and reduce the single engine minimum control speed. The climb performance of the C-82A aircraft is improved. The Jet Pak installation also provides emergency power in the event an engine is lost after take-off. At sea level, standard conditions, and 52,000 pounds gross weight with gear and flaps up, the C-82A with Jet Pak can climb-out to a safe altitude with the propeller on one engine feathered. If one engine is lost, the aircraft can maintain 9,000 feet altitude at 52,000 pounds gross weight with Jet Pak and one engine at maximum continuous power. There is no appreciable decrease in take-off distance with the Jet Pak in operation. The location of the Jet Pak on the top of the fuselage created an apparent reduction in elevator effectiveness during take-off. The handling qualities of the modified C-82A aircraft remain essentially unchanged. (Author)

AD-268 652 Div. 27, 14
(TISTM/TCG) OTS price $2.60

Atlantic Research Corp., Alexandria, Va.
IMPROVEMENT OF THE USEFULNESS OF PYROLYTIC GRAPHITE IN ROCKET MOTOR APPLICATIONS.
Quarterly progress rept., Sep-Nov 61.
15 Dec 61, 10p. illus. tables, 2 refs.
(Contract DA 36-034-ORD-3279, Proj. TB4-004)
Unclassified report

DESCRIPTORS: (Solid rocket propellants, *Rocket motor nozzles, *Graphite, Coatings, Refractory coatings, Processing, Production, Manufacturing methods, Microstructure.) (Thermal stresses, Stresses, Mathematical analysis, Design.) (Pyrolysis, Methanes, Propanes, Carbon deposits.) Tests, High temperature research.

Research was continued in 3 phases consisting of deposition process studies, mechanical design analysis, and preparation and motor test firing of pyrolytic graphite coated nozzle inserts. The deposition process studies showed that pyrolytic graphite coatings can be prepared in the temperature range from 1300 to 1700 C; coatings prepared below 1500 C are very coarse grained. Calculation of the residual thermal stresses formed in the coated bodies during the deposition process was continued. Motor firing tests in a 6500 F propellant showed that the coating was lost in 9 sec from the first test piece fired as a result of excessive motor pressure. A second test piece displayed a very good erosion rate of 0.48 mil/sec in a firing at normal high pressure. This erosion rate is superior to any other graphitic material tested to date. (Author)

AD-268 699 Div. 27, 26
(TISTA/LSK) OTS price $1.60

Lyon, Inc., Detroit, Mich.
DEEP DRAWN PRE-PRODUCTION UNITS A2 1ST STAGE POLARIS ROCKET MOTOR CHAMBERS AND A2 1ST STAGE POLARIS AFT CLOSURES.
General rept. no. 12, 31 July-31 Aug 61,
by Wayne A. Martin. 31 Aug 61, 10p.
(Contract NOw 60-0630)
Unclassified report

DESCRIPTORS: (Solid rocket propellants, Rocket motors, *Rocket cases, Processing, Manufacturing methods, Drawing (Machine processing), Tensile properties, Mechanical properties.) (Dies, Machine tools.)

AD-268 731 Div. 27, 12
(TISTW/RD) OTS price $5.60

Naval Ordnance Test Station, China Lake, Calif.
LIQUID INJECTION THRUST VECTOR CONTROL,
by C. J. Green and F. McCullough, Jr.
16 June 61, 56p. incl. illus. 8 refs. (Rept. no. NOTS TP 2711)
(NAVWEPS rept. no. 7744)
Unclassified report

DESCRIPTORS: (*Thrust, *Control by *Injection of *Liquids into Rocket motor nozzles.) (*Deflection of *Jets, Injection of Liquids.) (Deflection of Exhaust gases from Rocket motor nozzles by Jets.) (Control of Guided missile trajectories.) (Perchloryl radicals, Ethylenes, Chlorides.) (Nitrogen compounds, Tetroxides.) (Methyl radicals, Hydrazines.) (Chlorides, Fluorides, Methanes.) Bromine, Water.

The technique of obtaining thrust vector control by the injection of a liquid into the supersonic region of a rocket nozzle was studied. Liquids studied were water, Freon-12, Perchloroethylene, nitrogen tetroxide and bromine. In addition, unsymmetrical dimethylhydrazine and inhibited red fuming nitric acid were injected simultaneously to explore the effect of energy release in the nozzle exit cone with bipropellant injection. Data on the relationships of side force to injectant flow rate, the effect of axial location of the injection port, the effect of injection pressure and the effects of injectant properties are presented and discussed. (Author)

AD-268 736 Div. 27, 9
(TISTA/VGW) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
PRELIMINARY INVESTIGATION OF AN UNDERWATER RAMJET POWERED BY COMPRESSED AIR,
by Elmo J. Mottard and Charles J. Shoemaker.
Dec 61, 36p. incl. illus. 5 refs. (NASA Technical note D-991)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-991.

DESCRIPTORS: (*Hydroduct engines, Underwater propulsion, Compressed air, Thrust, Drag, Hydrodynamics, Theory, Mathematical analysis, Design, Model tests.)

Thrust, inlet pressure, and mixing-chamber pressure were determined at speeds between 20 and 60 feet per second for a hydroduct or underwater ramjet with a maximum diameter of 3.2 inches and a fineness ratio of 5.9, powered by compressed air (0.1 to 0.3 pound per second). Maximum efficiency was approximately 53 percent at a thrust coefficient of 0.10. The force and pressure coefficients were functions primarily of the ratio of airflow to free-stream velocity. Performance may have been influenced by choking of the exit. A theoretical development of the underwater ramjet cycle was made, with the assumption that the air-water mixture can be treated as a compressible gas. A method is suggested for including the effect of choking. An exploratory calculation indicated the effect of choking was minor. (Author)

AD-268 857 Div. 27, 26, 14
(TISTA/LSK) OTS price $2.60

Bendix Products Div., Bendix Corp., South Bend, Ind.
SERVICES TO GENERATE ENGINEERING DATA ON THE BEHAVIOR OF PLASTIC COMPOSITE STRUCTURES UNDER VARIOUS CONDITIONS OF STRESS.
Monthly progress rept. no. 9, 1-30 Nov 61, by F. P. Weldy. 21 Dec 61, 29p. incl. illus. tables (Rept. no. BPD-863-14317)
(Contract NOw 61-0488-c)
Unclassified report

DESCRIPTORS: (Plastics, Filament wound construction, Rocket cases, Processing, Manufacturing methods, Hydrostatic pressure, Stresses, Failure (Mechanics), Rupture, Tests.)

A description is given of the processes, materials, equipment, and instrumentation used to: (1) Fabricate and test an 18-inch case with nozzle ports added (scaled up from a 7-inch case); and (2) Fabricate and prepare a second 18-inch mandrel for wrapping. Failure occurred at the stress levels and location as predicted from the 7-inch case test data. (Author)

AD-268 872 Div. 27
(TISTA/LSK) OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio
ON THE PROBLEM OF THE "BLOCKING" OF THE DISTRIBUTING NOZZLE AND OF THE WORKING BLADING OF PROFILES IN A SUPERSONIC FLOW,
by M. Ye. Deych and A. V. Gubarev. 11 Dec 61, 19p. incl. illus. 5 refs. (Trans. no. MCL-1335/1+2 of Teploenergetika 12:27-33, 1960)
Unclassified report

DESCRIPTORS: (*Turbines, *Gas turbines, Axial flow turbines, Nozzles, Gas turbine nozzles, Supersonics nozzles, Gas flow, Boundary layer, Turbin blades, Fluid flow, Fluid mechanics, Mathematical analysis, Theory.)

An analysis of the blocking conditions is presented and a graphic method for their determination is developed. Some effects connected with blading blocking are examined, and the effect of the relative motion of the blading and head shocks upon the blocking conditions is analyzed. (Author)

AD-268 873 Div. 27
(TISTA/SEB) OTS price $7.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
PROBLEMS IN OPERATIONS OF HEAT ENGINES, TRUDY NO. 95 (SELECTED ARTICLES).
11 Dec 61, 68p. incl. illus. 23 refs. (Trans. no. FTD-TT-61-12/1+2 of Trudy Voprosy Rabochykh Protsessov Teplovykh 95:79-119, 1958)
Unclassified report

DESCRIPTORS: (Heat engines, *Gas turbines, *Gas turbine nozzles, Nozzles, Supersonic nozzles, Fluid flow, Fluid mechanics, Supersonics, Gas flow, Turbine blades, Deflection, Pressure, Mathematical analysis, Equations, Theory.) (*Centrifugal pumps, Air, Gas flow, Fluid flow, Theory, Mathematical analysis, Design, Tests.)

GAS FLOW IN AN OBLIQUE TIP OF SINGLE NOZZLES AND TURBINE NOZZLES: Formulas are derived for determining the deflection of a stream in an oblique tip of an unprofiled diverging nozzle and for nozzle blading with an edge of finite thickness. The critical pressure ratio in nozzle blading with an edge of finite thickness is greater than in single nozzles and can be taken into account when calculating the characteristics of motors, including turbine machines. SIMULATING THE OPERATION OF A CENTRIFUGAL PUMP USING AIR: The performance of a liquid pump can be plotted with an accuracy by simulating the operation of the pump by using air. The drive power of the test pump operating on air was by a factor of about 85 less than the power required by the same pump operating on water. The results can be used in the experimental treatment of new centrifugal pumps of high efficiency whose flow sections have a complex form.

AD-268 875 Div. 27
(TISTA/SEB) OTS price $9.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
CALCULATING THE ALTITUDE AND VELOCITY CHARACTERISTICS OF TURBOJET ENGINES (Raschet Vysotno-Skorostnykh Kharakteristik Turboreaktivnykh Dvigateley),
by N. I. Markov and V. I. Bakulev. 28 Aug 61, 100p. incl. illus. tables, 5 refs. (Trans. no. MCL-1059/1+2 of Gosudarstvennoye Nauchno-Tekhnicheskoye Izdatel'stvo Oborongiz, Moskva, 80p., 1960)
Unclassified report

DESCRIPTORS: (*Turbojet engines, *Handbooks, Fuel consumption, Velocity, Operation, Temperature, Thrust, Theory, Mathematical analysis, Design.) USSR.

The book presents a method of calculating the altitude and velocity characteristics of turbojet engines, and the necessary material is appended for conducting these calculations. Examples are given for calculating lines of combined operation of turbine and compressor for compressor characteristics, using various methods of controlling engines; an example of calculating the altitude and velocity characteristics is also given. The book is a text for students of advanced courses and graduates, specializing in aircraft turbojet engines, and can be useful for workers in design bureaus and plants. (Author)

AD-268 925 Div. 27, 26, 17, 12
(TISTW/EET) OTS price $5.60

Lyon, Inc., Detroit, Mich.
DEVELOPMENT OF DEEP DRAWN - ONE PIECE HIGH PERFORMANCE ROCKET MOTOR CASE.
General rept. no. 12, 10 Sep-10 Oct 61,
by Wayne A. Martin. 10 Oct 61, 49p. illus.
(Contract DA 20-018-ORD-23004)
Unclassified report

DESCRIPTORS: (*Rocket motors, Solid rocket propellants, *Rocket cases, Production, Manufacturing methods. (Drawing (Machine processing), Tools, Dies, Nickel alloys, Titanium alloys, Microstructure, Heat treatment, Deformation, Processing, Tests.) (Guided missiles, Surface to surface, Rocket propulsion.)

28. PSYCHOLOGY AND HUMAN ENGINEERING

AD-268 162 Div. 28
(TISTB/MS) OTS price $6.60

Chicago U., Ill.
STUDIES OF PATTERN-PERCEIVING AND LEARNING NETWORKS.
Annual rept.,
by Peter H. Greene. 28 Feb 61, 60p.
(Contract Nonr-212117, Proj. NR 049-148)
Unclassified report

DESCRIPTORS: (*Learning, *Space perception, *Perception, Behavior.) (*Reading machines, *Teaching machines, Training devices, Design.) (*Psychology, Children.)

Information is presented from the following: (1) Some Biological Ideas,' Remarks from 1960 Bionics Symposium; (2) 5th and 6th Quarterly Progress Reports, concerning the development of perceptual schemata and perceptual geometry; (3) 6th Quarterly Progress Report, concerning some details of the mathematical model, some ideas from behavioral studies of perception and instinctive behavior, and mathematical discussion of some points raised by mechanisms of recognition in instinctive behavior; (4) 'Some Ingredients of Perception,' notes on pp. 1-218 of Piaget, The Construction of Reality in the Child, (1937). Translation by M. Cook (New York: Basic Books Publishing Co., 1954.); and (5) 'Representation of Spatial Organization,' notes on Chapters I-III of J. Piaget and B. Inhelder, The Child's Conception of Space. Translation by F. J. Langdon and J. L. Lunzer (New York: Humanities Press, 1956.) (Author)

AD-268 172 Div. 28
(TISTB/MS) OTS price $5.60

Research Center for Mental Health, New York U., N. Y.
A COMPARISON OF ISOLATION EFFECTS AND THEIR PERSONALITY CORRELATES IN TWO DIVERGENT SAMPLES.
Final rept. Oct 59-Feb 61 on Biophysics of Flight,
by Leo Goldberger and Robert R. Holt. , Aug 61, 46p. incl. tables, 22 refs.
(Contract AF 33(616)6103, Proj. 7222)
(ASD TR 61-417) Unclassified report

DESCRIPTORS: (*Sensory deprivation, *Personality, Behavior, Tests.) Factor analysis.

Findings are reported from a pair of replicated studies using male subjects and conditions of perceptual isolation (sensory deprivation) similar to those used in the McGill studies. The first group consisted of 14 undergraduates; the second group consisted of 16 unemployed actors. All subjects were put through an intensive multiform assessment, including a battery of objectively scorable tests, plus qualitative data from projective techniques, interview, and autobiography. Reactions to the altered sensory environment, which the subjects experienced for 8 hours, were judged from the typed protocols of their verbalizations during the period of confinement. In all, 14 dependent variables were derived from the protocols. These were then intercorrelated, and both the individual variables and their syndromes were related to the variables from the personality assessment. First the general group phenomena, then the patterns of correlations are discussed, with the special emphasis on those that were replicated. Implications for space flight are discussed in terms of the nature of the sensory alteration involved and other specific aspects of the experiment. (Author)

AD-268 203 Div. 28
(TISTB/MS) OTS price $8.60

Army Research Office, Office of the Chief, Research and Development, Washington, D. C.
SECOND ANNUAL ARMY ENGINEERING PSYCHOLOGY CONFERENCE 7, 8, 9, NOVEMBER 1956 AT ARMY MEDICAL RESEARCH LABORATORY, FT. KNOX, KY.
Conference rept.
21 Dec 56, 90p. incl. illus. tables.
Unclassified report

DESCRIPTORS: (*Human engineering, *Conferences, *Symposia.) (*Military personnel, *Military psychology, Military equipment.)

AD-268 204 Div. 28
(TISTB/MS) OTS price $9.60

Army Research Office, Office of the Chief, Research and Development, Washington, D. C.
THIRD ANNUAL ARMY HUMAN FACTORS ENGINEERING CONFERENCE 2, 3, 4, OCTOBER 1957 QUARTERMASTER RESEARCH AND ENGINEERING COMMAND, NATICK, MASSACHUSETTS.
Conference rept.
28 Oct 57, 115p. incl. illus.
Unclassified report

DESCRIPTORS: (*Human engineering, Conferences, Symposia.) (Military personnel, Military equipment, Gas masks, Control panels, Ordnance.) (Noise, Hearing.) (*Prosthetics, Design.) Night warfare.

AD-268 207 Div. 28
(TISTB/MS) OTS price $16.50

Army Research Office, Office of the Chief, Research and Development, Washington, D. C.
SIXTH ANNUAL ARMY HUMAN FACTORS ENGINEERING CONFERENCE 3-6 OCTOBER 1960 U. S. ARMY ENGINEER RESEARCH AND DEVELOPMENT LABORATORIES FORT BELVOIR, VIRGINIA.
Army, Industry and the Soldier rept.
14 Dec 60, 247p. incl. illus. tables.
Unclassified report

DESCRIPTORS: (*Human engineering, *Conferences, *Symposia.) (*Military personnel, *Military equipment, Design, Control systems.) (*Noise, Attenuation by Helmets.) (Training devices, Aviation injuries, Military psychology, Drugs.)

AD-268 308 Div. 28
(TISTB/MS) OTS price $1.10

Louisiana State U., Baton Rouge.
TEST OF A PROPOSED THEORY OF LEADERSHIP.
Annual rept. no. 7 on Behavior in Groups, by Bernard M. Bass. 15 Nov 61, 5p. 15 refs.
(Contract N7onr-35609)
Unclassified report

DESCRIPTORS: (*Leadership, *Behavior, *Group dynamics.)

AD-268 310 Div. 28
(TISTB/MS) OTS price $1.60

Louisiana State U., Baton Rouge.
MOOD CHANGES DURING A MANAGEMENT TRAINING LABORATORY.
Rept. on Behavior in Groups, by Bernard M. Bass. Nov 61, 9p. incl. illus. 5 refs. (Technical rept. no. 30)
(Contract N7onr-35609; In cooperation with Calif., U.)
Unclassified report

DESCRIPTORS: (*Emotions, Behavior, Sensitivity, Factor analysis.) (Training for Leadership, Management engineering.)

Thirty trainees completed a mood adjective check list at 5 periods during a 10 day sensitivity training laboratory for management. Results indicate that differences, and predictable shifts in mood do occur. Specifically, skepticism and anxiety decrease as most trainers would expect; and other moods like depression and aggression show the effects of particular training laboratory procedures. The results also provide independent evidence of the validity of the factored Nowlis and Green check list of mood adjectives. Laboratory experience by trainers resulted in a body of generalizations about how trainee feelings change during the course of the sensitivity training laboratory. The design of a laboratory is based on these generalizations to some degree. Findings generally are consistent with trainer beliefs about mood changes in trainees including trainees' reduction in skepticism and anxiety during the course of a laboratory and increased concentration as a consequence of introducing intergroup competition. Results also conform to expectations about the effects on mood of defeat or victory in the competition. (Author)

AD-268 339 Div. 28
(TISTB/MS) OTS price $2.60

Naval Medical Research Lab., New London, Conn.
THE SELF-REPORTED MOTIVATIONAL QUESTIONNAIRE (SMQ): A PRELIMINARY VALIDATION STUDY WITH A POPULATION OF ENLISTED SUBMARINER VOLUNTEERS, by Barbara A. Rubin and James W. Parker.
2 Feb 61, 18p. illus. tables, 13 refs.
(Rept. no. 348; Vol. 20, no. 2)
(Proj. MR005.14-2100-2.04)
Unclassified report

DESCRIPTORS: (*Behavior, Needs, Attitudes, Submarine personnel, Tests, Design.)

The construction and keying of the Self-Reported Motivational Questionnaire (SMQ are described. With enlisted Submarine School volunteers the scores are related to attrition in Submarine School. These relationships are presented with several breakdowns such as rated/non-rated, high/low scores on the Basic Test Battery, and are described in detail. The discussion of the reliability and validity of the SMQ conclude, that the scores are usefully reliable, and that they are usefully valid for that portion of the population whose aptitude (ARI + MECH) is below the median for the total population. The final academic rank order of the 1100 Submarine School graduates studied is significantly correlated with the SMQ only for the low aptitude group. (Author)

AD-268 417 Div. 28
(TISTB/MS) OTS price $1.60

Delaware U., Newark.
RACE AND RATIO PERCEPTION.
by Robert C. Ziller and Richard D. Behringer.
2 Dec 61, 17p. incl. tables, 4 refs. (Technical rept. no. 6)
(Contract Nonr-228502)
Unclassified report

DESCRIPTORS: (*Perception, *Visual perception, *Anthropology, Sociology.) (*Sociometrics, *Visual perception, Tests, Analysis of variance.)

A study was made of the hypothesis that minority group members who are visually distinguishable in contrast to majority group members tend to possess a distorted perception of the percentage of marked or unmarked objects in a visual field, particularly when the marked objects represent members of their own minority group. The associations between various characteristics of the elements in the perceptual field and ratio perception were also explored. The critical task required the subjects (Ss) to estimate the percentage of marked or unmarked objects in a field of sixty objects displayed for one second. The independent variables included the race of the perceiver (Negro or White): the percentage of focused objects in the field (10% to 90% in intervals of ten); the heterogeneity of the field of objects (two or three different objects); the labelling of the objects as zero, minus, plus as opposed to European, Asian, African; and the focused object (unmarked circle, minus-marked circle, or plus-marked circle). In general, the Negroes in contrast to the Whites tended to underestimate the percentage of unmarked objects in the perceptual field. These results were interpreted as supporting, in part, the initial framework. Moreover, it was found that higher estimates were submitted when three rather than two varieties of objects were displayed. (Author)

Division 28-PSYCHOLOGY AND HUMAN ENGINEERING

AD-268 456 Div. 28
(TISTB/MS) OTS price $1.60

Bureau of Medicine and Surgery, Washington, D. C.
THE IDENTIFICATION OF CHARACTER AND BEHAVIOR DISORDERS IN THE MILITARY LIFE,
by Walter L. Wilkins. 1960, 18p. 58 refs.
Unclassified report

Read at the Fifth Navy Science Symposium at U. S. Naval Academy, Annapolis, Maryland on April 20, 1961.

DESCRIPTORS: (*Behavior, *Adjustment (Psychology). Military requirements.) (*Military psychology, *Psychiatry, Psychology, Personality.)

AD-268 462 Div. 28, 30
(TISTB/MS) OTS price $10.50

Michigan U. Coll. of Literature, Science, and the Arts, Ann Arbor.
THE EFFECTS OF LOAD AND ACCESSIBILITY OF INFORMATION UPON PERFORMANCE OF SMALL TEAMS,
Doctoral thesis,
by H. G. Moore. Oct 61, 125p. incl. illus. tables, 45 refs. (Rept. no. 02814-8-T)
(Contract AF 49(638)449)
(AFOSR-1636) Unclassified report

DESCRIPTORS: (*Group dynamics, Data processing systems, Information theory, Learning, Tests, Effectiveness.)

Contents:
A review of studies of the effects of situational variables upon team performance
The effect of information nets on:
(1) problem solving and information processing
(2) organizing for work
(3) learning
(4) satisfaction
The effect of load on:
(1) problem solving and information processing
(2) organizing for work
(3) learning
(4) satisfaction
The effect of feedback on:
(1) problem solving and information processing
(2) decision making and information processing
(3) organization for work
(4) learning
The effect of task on organization for work
An experiment concerning the effects of load and information accessibility upon team performance

AD-268 471 Div. 28
(TISTB/LH) OTS price $2.60

Psycho-Acoustic Lab., Harvard U., Cambridge, Mass.
(No title).
Periodic Status rept. no. 38, 16 May-1 Dec 61.
1 Dec 61, 10p. illus. (Rept. no. PNM-94)
(Contract Nonr-186615, Proj. NR 142-201)
Unclassified report

DESCRIPTORS: (*Psychoacoustics, Psychoneurosis, Skin, Stimulation, Auditory perception, Light adaptation, Visual thresholds, Visual perception.)

Contents:
The gap between the hearing of external and internal sounds
The quantification of tonal volume
Comments on the measurement of the relative size of d-c potentials and microphonics in the cochlea
Can we feel the nervous discharges of the end organs vibratory stimulation of the skin
The scaling of subjective roughness and smoothness
Concerning the pleasures of observing, and the mechanics of the inner ear
Fractionation of brightness under conditions of simultaneous contrast
Apparatus for the study of contrast
Subjective brightness of visual stimuli of various durations and luminances
Subjective brightness during dark adaptation
Studies of loudness, softness, distance, and reciprocality
The transition level: a discontinuity in the intensitive difference limen
A test of binocular summation
Subjective saturation of a color

AD-268 557 Div. 28
(TISTB/JAB) OTS price $6.60

Amarillo Technical Training Center (ATC), Amarillo Air Force Base, Tex.
EVALUATION OF THE RETRAINING PROGRAM.
Semi-annual rept.,
Nov 61, 60p. incl. illus. tables.
Unclassified report

DESCRIPTORS: (Training, *Aviation personnel, *Adjustment (Psychology), Attitudes, Military psychology, Criminology.)

The emphasis of the present study has been to gather and analyze quantitative and qualitative information on the progress of restorees from the Retraining Group six months following restoration. The hypothesis of the study is that a follow-up analysis of important restoration outcomes is a logical place at which to begin an evaluation of the effectiveness of the Air Force's rehabilitation effort. Evaluative criteria established for the study include: retrainee dispositions; rates of successful restoration; squadron commander ratings on usefulness and performance of duty of restorees; skill level gains; rank improvement; and career field representation. Previous studies in this continuing series indicate that the Retraining Program has an amazingly high performance record, both quantitatively and qualitatively, compared with other military and civilian correctional institutions. (Author)

AD-268 601 Div. 28
(TISTB/MS) OTS price $1.00

Harvard U. Medical School, Boston, Mass.
SELECTED BIBLIOGRAPHY OF SENSORY DEPRIVATION AND RELATED SUBJECTS.
Rept. for 1 Sep 60-1 Jan 61 on Biophysics of Flight,
comp. by P. Herbert Leiderman and Robert Stern.
July 61, 28p. 355 refs.
(Contract AF 33(616)6110, Proj. 7220)
(ASD TR 61-259) Unclassified report

DESCRIPTORS: (*Bibliography, *Sensory deprivation, Inhibition, Behavior.)

This bibliography compiles and classifies the available articles and books relevant to the field of sensory deprivation. The bibliography covers review articles, theoretical publications, anecdotal reports, experimental, clinical, developmental and social accounts, sleep deprivation, vigilance, level of activation and arousal, animal, and physiological studies. American and British publications in this field are reasonably well covered. A search of the literature of other countries did not yield any references specific to sensory deprivation. (Author)

AD-268 618 Div. 28
(TISTB/JAB) OTS price $1.10

Ohio State U. Research Foundation, Columbus.
ORIGINALITY IN GROUP PRODUCTIVITY.
Final annual summary rept. 1 Jan 58-15 Nov 61, by Pauline N. Pepinsky and Harold B. Pepinsky. 15 Nov 61, 6p. 14 refs. (Rept. no. 16)
(Contract Nonr-49515, Proj. NR 170-396)
Unclassified report

DESCRIPTORS: (*Group dynamics, Behavior, Management engineering, *Industrial relations, Sociometrics, Production, Effectiveness.) *Industrial psychology.

AD-268 656 Div. 28
(TIPSB/LH) OTS price $2.50

Behavioral Sciences Lab., Aerospace Medical Div., Wright-Patterson Air Force Base, Ohio.
HUMAN FACTORS OF REMOTE HANDLING IN ADVANCED SYSTEMS SYMPOSIUM, 18-19 APRIL 1961.
Rept. on Human Factors in Advanced Systems, ed. by Heather R. Braman. 19 Apr 61, 192p. incl. illus. tables, refs.
(Proj. no. 7184)
(ASD TR 61-430) Unclassified report

DESCRIPTORS: (*Symposia, Space environmental conditions, Ground support equipment, *Remote control systems, Tools, Handling, Television, Three dimensional display systems, Human engineering.)

Contents:
Human factors in remote handling
Considerations for developing remote-control tools
Operator selection, training, and efficiency in the field of remote handling
A brief historical account of the important phases of the aircraft nuclear propulsion project
Ground support equipment, human factors studies
Manned ground support equipment
Unmanned ground support equipment
The space environment and its implication on manned flight operations
Human factors in design of remote-handling equipment
Operator-machine relationships in the manipulator
Human factors in the design of remote manipulators

AD-268 782 Div. 28
(TISTB/MS) OTS price $.75

Research Center for Mental Health, New York U., N. Y.
STUDIES ON THE EFFECTS OF PERCEPTUAL ALTERATION.
Rept. for Oct 59-Feb 61, on Biophysics of Flight, by Leo Goldberger and Robert R. Holt. Aug 61, 20p. 13 refs.
(Contract AF 33(616)6103, Proj. 7222)
(ASD TR 61-416) Unclassified report

DESCRIPTORS: (*Sensory deprivation, *Perception, Visual perception, *Attention, Tests.)

Three separate studies explored facets of sensory alteration (sensory deprivation). One study focussed on the role of a diffuse, homogeneous visual field (Ganzfeld) in promoting visual images; the second compared performance on a cognitive test battery immediately following eight hours of perceptual isolation with performances under a drug (100 gamma of LSD-25) and a placebo condition; the third study dealt with the effects upon cognitive functioning of an eight-hour isolation experience, during which constant auditory vigilance was required of the subjects. (Author)

AD-268 883 Div. 28, 30
(TISTB/MS) OTS price $1.60

Air Force Missile Development Center, Holloman Air Force Base, N. Mex.
PERFORMANCE BY A RHESUS MONKEY ON A TEMPORALLY REINFORCED ODDITY PROBLEM,
by Frederick H. Rohles, Jr. Oct 61, 8p. incl. illus. 7 refs. (AFMDC TR 61-31)
(Proj. no. 6893)
Unclassified report

DESCRIPTORS: (*Primates, *Reaction (Psychology), *Conditioned reflex, *Training devices, Tests, Test equipment, Automatic.) *Display systems.

AD-268 884 Div. 28, 30
(TISTB/MS) OTS price $1.10

Air Force Missile Development Center, Holloman Air Force Base, N. Mex.
A SPATIALLY CONTIGUOUS STIMULUS-RESPONSE APPARATUS FOR PRIMATES,
by Frederick H. Rohles, Jr. and Marvin E. Grunzke. Oct 61. 5p. incl. illus. 2 refs.
(AFMDC-TR 61-32)
(Proj. no. 6893)
Unclassified report

DESCRIPTORS: *Primates, *Reaction (Psychology), *Conditioned reflex, *Training devices, Automatic, Test equipment, *Display systems, Tests.

This report describes a stimulus-response device for primates in which the response manipuladum and stimulus cue are combined into a single unit. Considerable success has been obtained with this device in cognitive learning problems. (Author)

AD-268 913 Div. 28, 18, 23
(TISTB/CCH) OTS price $1.60

Human Engineering Lab., Aberdeen Proving Ground, Md.
THE EFFECTS OF TWENTY-FOUR HOURS CONFINEMENT IN MOBILE ARMORED PERSONNEL CARRIERS ON SELECTED COMBAT RELEVANT SKILL. STUDY V,
by Samuel A. Hicks. Nov 61, 10p. incl. table, 7 refs. (Technical memo. no. 23-61)
Unclassified report

DESCRIPTORS: (*Psychometrics, *Military personnel, *Tanics, Tracked vehicles.) (*Combat, Confinement, Reaction time.)

This investigation is the fifth in a series designed to determine changes in general combat relevant performance as a result of sustained confinement in Armored Personnel Carriers (APCs). The purpose was to determine changes in performance as a result of 24 hours confinement in mobile APCs. Forty-four enlisted men were tested before and after confinement on tests designed to measure stamina, eye-arm coordination, locomotor coordination, equilibrium, and hand-arm steadiness. The 24-hour confinement period resulted in a statistical significant loss in eye-arm coordination and hand-arm steadiness (marks-manship). Recommendations are included for future research. (Author)

AD-268 914 Div. 28
(TISTB/MS) OTS price $1.60

Human Engineering Lab., Aberdeen Proving Ground, Md.
EFFECTS OF THREAT OF PUNISHMENT ON MONITORING

PERFORMANCE,
by Sam Glucksberg and Robert Karsh. Oct 61, 11p. incl. illus. tables, 10 refs. (Technical memo. 5-61)

Unclassified report

DESCRIPTORS: (*Reaction (Psychology), Reaction time, Electroshock, Stimulation, Conditioned reflex, Effectiveness.) Attention.

The effect of electric shock punishment on visual monitoring efficiency was investigated. Both males and females served as subjects. Performance decrements as a function of task duration were obtained. No main effects of shock were observed. The data did suggest that males and females were differentially affected by shock punishment. The performance of males seemed to be improved, while the female's performance appeared to have beenimpaired by shock punishment. These data, if reliable, present difficulties for the major theories of vigilance behavior. (Author)

29. QUARTERMASTER EQUIPMENT AND SUPPLIES

AD-268 302 Div. 29
(TISTB/LH) OTS price $.50

Aerospace Medical Lab., Aeronautical Systems Div., Wright-Patterson Air Force Base, Ohio.
SUITABILITY OF TUBED FOODS FOR IN-FLIGHT FEEDING.
Rept. for Nov 58-May 59 on Space Biology Research,
by Jerry L. Welbourn and Paul A. Lachance.
Sep 61, 6p. incl. illus. tables, 5 refs.
(Proj. 7164)
(ASD TR 61-456) Unclassified report

DESCRIPTORS: (*Food, *Feeding, Acceptability, Containers, Aviation personnel, *Flight.)

Nineteen tubed foods were evaluated to determine their acceptability and suitability for in-flight feeding under restricted flight conditions. Ten of the foods were evaluated both at ground level and at a simulated altitude of 30,000 feet with the subjects wearing the MA-2 pressure helmet. The remaining nine foods were evaluated at ground level without a helmet. Results indicate that tubed foods are a practicable and acceptable method of feeding aircrews under the above conditions. Twelve of the nineteen foods in the tubes had a sufficient degree of acceptability to warrant their use in operational situations. (Author)

AD-268 478 Div. 29
(TISTB/LH) OTS price $1.60

Quartermaster Food and Container Inst. for the Armed Forces, Chicago, Ill.
VITAMIN RETENTION IN FORTIFIED FRUIT TABLETS DURING STORAGE.
Interim rept on Simplified Food Logistics,
by Miriam H. Thomas. Nov 61, 14p. tables, 5 refs. (QMFCIAF Rept. no. 24-61)
(Proj. 7-84-06-032)

Unclassified report

DESCRIPTORS: (*Military rations, *Nutrition, *Vitamins, Vitamin A, Thiamine, Ascorbic acid, Pyridoxine.) (Food, Fruits, Storage, Acceptability, Effectiveness.)

Fruit tablets were fortified with vitamins A, C, thiamine, and pyridoxine and stored one year at 100 F. Good retention of ascorbic acid and thiamine was obtained throughout storage and palatability ratings were not affected by their presence. Vitamin A stability was affected by the type of candy base employed being more stable in sucrose than in a mixture of 60 percent sucrose with 40 percent corn syrup. The presence of vitamin A lowered palatability ratings for fruit tablets, but not enough to exclude fortification with this vitamin. No analyses were made for pyridoxine content. (Author)

AD-268 538 Div. 29, 20
(TISTB/LH) OTS price $2.60

Quartermaster Food and Container Inst. for the Armed Forces, Chicago, Ill.
FURTHER STUDIES ON REDUCTION OF X-IRRADIATION MORTALITY OF GUINEA PIGS BY PLANT MATERIALS.
Interim rept. on Study of Relationship of Foods to Radiation Effects,
by Doris Howes Calloway, W. K. Calhoun, and A. H. Munson. Nov 61, 26p. incl. illus. tables, 26 refs. (QMFCIAF rept. no. 12-61)
(Proj. 7-84-13-002)

Unclassified report

DESCRIPTORS: (*Diet, *Radiation hazards, Radiation effects, Inhibition, Laboratory animals.) (*X rays, Sensitivity, Safety.)

Exposure to 400 r of whole-body X-irradiation resulted in 97 percent mortality in 10 to 15 days among young male guinea pigs fed a basal diet of bran and oats plus ascorbic acid. Supplementation with alfalfa or broccoli, for two weeks before irradiation and during 30 days after irradiation reduced mortality and extended survival time. Although supplementation of an adequate purified diet with broccoli or alfalfa promoted superior weight gain, radiosensitivity was unaffected under these conditions. The beneficial effect of green plant supplementation could not be duplicated by feeding a mixture of 48 chemically-defined ingredients patterned upon the composition of broccoli, in conjunction with the bran-oats diet. The radioprotective agent(s) in alfalfa was water-soluble. (Author)

AD-268 957 Div. 29, 24, 32
(TISTP/MS) OTS price $3.60

Army Rocket and Guided Missile Agency, Huntsville, Ala.
UTILIZATION OF THE PHOTOGRAPHIC METHOD FOR DETERMINING BODY DIMENSIONS OF THE 95TH PERCENTILE ARCTIC CLOTHEDSOLDIER,
by Robert F. Chaillet. 7 Nov 61, 38p. incl. illus. tables, 9 refs. (Rept. no. ARGMA TN 2B1N)

Unclassified report

DESCRIPTORS: (*Anthropometry, *Military personnel, *Clothing, Arctic regions, *Human engineering, *Photography, Measurement.)

This study was designed to test the concept of presenting the dimensions of the arctic clothed Soldier by means of photographs. Engineering personnel of the Army Rocket and Guided Missile Agency served as subjects to obtain measurements of the height and width from nine photographs of the 95th percentile arctic clothed Soldier. Measurements discrepancies among subjects and photographs were statistically significant, and lead to the conclusion that this particular method of presenting anthropometric data is neither valid nor reliable. Recommendations for presenting the required anthropometric data have been included. (Author)

30. RESEARCH AND RESEARCH EQUIPMENT

AD-268 232 Div. 30 17
(TISTM/TCG) OTS price $1.25

Directorate of Materials and Processes, Aeronautical Systems Div., Wright-Patterson Air Force Base, Ohio.
ANALYSIS OF REFRACTORY METALS USING A NEW SOLID SOURCE DOUBLE FOCUSING MASS SPECTROMETER.
Rept. for May-Dec 60 on Experimental Techniques for Materials Research,
by William L. Baun and David W. Fischer.
June 61, 38p. incl. illus.
(Proj. 7364)
(ASD TR 61-183) Unclassified report

DESCRIPTORS: (Mass spectroscopy, Solids, *Mass spectrometers, Instrumentation, Test methods, Photometers, Sensitivity.) (Metals, Refractory materials, Impurities, Tungsten, Tungsten compounds, Chlorides, Phase studies, Niobium, Erbium.) (Atomic weight, Abundance.)

A newly developed solid sample-spark source mass spectrometer capable of sensitivities of 0.1 to 0.01 ppm is briefly described. Analytical techniques, methods, and results are presented for the analysis refractory metals. Emphasis is placed on trace element analysis of high purity single crystal and polycrystalline W and comparisons are made concerning methods of purification. Data are also shown for analysis of W in which a dispersed second phase such as ThO2 exists. Analysis of other components purposely introduced to W to increase yield and creep rupture strength is discussed. (Author)

AD-268 303 Div. 30, 25
(TISTW/JRG) OTS price $.50

Watertown Arsenal Labs., Mass.
A PRIMARY ULTRASONIC STANDARD,
by Satrak Der Boghosian and John W. Orner.
Dec 61, 17p. incl. illus. 2 refs. (Technical rept. no. WAL TR 143.8/1)
Unclassified report

DESCRIPTORS: (*Ultrasonics, *Non-destructive testing, Test equipment, Instrumentation, Sensitivity, Calibration with Steel, Spheres, Ball bearings in Water.) (*Reflection, *Ultrasonic radiation, *Steel, *Spheres, Ball bearings in Water.) Qualtiy control, Test equipment, Instrumentation.)

For purposes of ultrasonic inspection specifications, it is essential that a primary standard be available by which instrument sensitivity, or response, can be defined in terms of known and repeatable parameters. For this purpose, a method is suggested by which the response obtained from a steel ball in water can be utilized for accurately defining any desired level of instrument sensitivity. Acceptance levels can be specified in terms of parameters which can be strictly defined for specification purposes. (Author)

AD-268 322 Div. 30, 8, 1, 12
(TISTW/DLW) OTS price $11.50

Gentile Air Force Depot, Dayton, Ohio.
PROCEEDINGS OF THE AUTOMATIC TEST EQUIPMENT SYMPOSIUM HELD AT DAYTON AIR FORCE DEPOT, 10, 11 JANUARY 1961.
1961, 152p. incl. illus. tables.
Unclassified report

DESCRIPTORS: (Supply depots, *Test sets, Test epuipment, *Maintenance equipment, Test facilities, Electronic equipment, Automatic, Military repuirements, Symposia.)

Contents:
Management benefits through use of ATE: The Heath facility; Versatile automatic test equipment; AN/GJQ-9 - the common factor of automatic checkout; Automatic test equipment objectives; Project SETE address; Automatic test equipment evaluation report; Automatic test equipment progress report; Feasibility study of automatic test equipment application; MENEX: Automatic test epuipment transcript; Automatic test equipment project status at Middletown Air Materiel Area; Project Rand on automatic checkout; The ADEPT program; The reliability study. (Author)

AD-268 323 Div. 30, 8
(TISTE/CRJ) OTS price $19.75

General Dynamics/Electronics, Rochester, N. Y.
AUTOMATIC TEST EQUIPMENT STUDY EXTENSION.
Final engineering rept.
1961, 308p. incl. illus. tables.
(Contract AF 33(604)32036; Continuation of Contract AF 33(604)28541)
Unclassified report

DESCRIPTORS: (*Electronic equipment, *Electronic circuits, Airborne, Test equipment, *Test facilities, Test sets, Automatic, Design.)

Work was performed on a study program determining the detail requirements for an automatic test system for testing of airborne electronic equipment. Presented is the technical information required to pursue an equipment development program of the versatile automatic test system utilizing a building block concept of design. The system will have capabilities of performing fault isolation on over 35 airborne electronic systems (not including WRAMA equipments) including piece part fault location on various subassemblies of these systems. The automatic test system is not limited to the 35 airborne electronics systems studied in detail, but has an estimated capability of checking 80% (exclusive of special cables required) of electronic equipment in the Air Force Inventory. Various problems associated with implementing an automated test facility were considered and studied. Those considered were logistic support, planning, scheduling and changing skill levels. Also considered were economic advantages gained due to expected increase in MTBF of the airborne electronic equipment due to exhaustive testing possible thru use of automation. (Author)

AD-268 324 Div. 30
(TISTW/DLW) OTS price $3.60

General Dynamics/Electronics, Rochester, N. Y.
AUTOMATIC TEST EQUIPMENT STUDY EXTENSION.
Addendum to Final engineering rept.
1961, 28p.
(Contract AF 33(604)32036)
Unclassified report

DESCRIPTORS: (Supply depots, *Test sets, Test equipment, Automatic, Test facilities, Electronic equipment, *Maintenance equipment, Military requirements.)

The requirements of a depot oriented automatic test system are further defined by determining

the extent to which the automatic test system is applicable to other epuipments serviced by the Dayton Air Force Depot and also to equipments serviced by three Air Materiel Areas: Warner Robins, Mobile and San Antonio. Besides including additional complex airborne system, studies at these air materiel areas involved application of the ATE system to the testing of special purpose AGE units at MOAMA and to special communications epuipment at SAAMA. (Author)

AD-268 329 Div. 30
(TISTM/TCG) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
A SPECTROPHOTOMETRIC ATTACHMENT FOR THE VACUUM ULTRAVIOLET,
by Norman N. Axelrod. Dec 61, 7p. incl. illus. 5 refs. (NASA Technical note D-699)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-699.

DESCRIPTORS: (*Ultraviolet spectrophotometers, Ultraviolet equipment, Vacuum apparatus, Absorption, Spectrophotometers, Laboratory equipment, Design.) (Cellulose, Thin films, Measurement.)

An absorption spectrophotometric attachment to a vacuum uv monochromator was built and tested. With the sample chamber empty, the ratio of the radiant flux through the sample chamber to the radiant flux through the reference chamber was measured. By optimizing the conditions at the entrance slit, the ratio was kept constant within experimental error over the region 1000 to 1600 angstroms. The transmittance of thin celluloid films was measured with the attachment. (Author)

AD-268 360 Div. 30
(TISTW/RD) OTS price $6.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
A SYSTEMATIC METHOD FOR CHARACTER RECOGNITION,
by David L. Fritzsche. 15 Nov 61, 56p. incl. illus. tables, 5 refs. (Rept. no. 1222-4)
(Contract AF 33(616)6137)
Unclassified report

DESCRIPTORS: (Identification of *Mathematical computer data, *Translations, Mathematical analysis, Fourier analysis, Series.) (*Digital computers, Programming.) Machine translation.

A technique for character recognition is described which possesses several characteristics necessary for satisfactory recognition. The desirable characteristics are: (1) each character is representable by a unique mathematical expression; (2) the recognition technique is independent of character size; (3) the technique is independent of character orientation; and (4) the gross features of a character are identified by using only a limited number of terms of the mathematical expression. The principal disadvantage of the technique is that it is sensitive to irregularities or distortions of standard figures. The technique is considered feasible for the recognition of typed letters or numbers, where the figures are distinct and are identical for each appearance. Hand written letters and words are not adaptive to this technique because of the immense number of standard characteristics which would be necessary.

AD-268 444 Div. 30, 8
(TISTW/RD) OTS price $6.60

Nortronics Div., Northrop Corp., Anaheim, Calif.
ADEPT COMPUTER CONTROL.
Study rept.,
by R. N. Bacon, G. Gerson and J. A. Semenick.
6 Dec 60, 65p. incl. illus. tables, 5 refs.
(NSS Rept. no. 783)
(Contract AF 33(604)29644)
Unclassified report

DESCRIPTORS: (Automatic, Control of Tests with *Computers.) (*Digital computers, *Programming, *Data processing systems, Data storage systems, Memory devices.) (Air force equipment, Tests, Reliability, Mathematical computer data, Analysis, Electronic equipment, Radio equipment, Radar equipment, Military requirements.)

The introduction of computer control into an automatic testing system has a pronounced effect on the characteristics of the system. An objective study was performed to determine how to achieve the most benefit from the extended testing capabilities provided by computer control. Test requirements were analyzed as the basis for establishing testing system performance specifications and desirable computer characteristics. A hypothetical computer, especially suited for automatic testing, was conceived and described in sufficient detail to permit actual programming of a sample test. Benefits of computer control are described in specific as well as general terms, showing both immediate and potential advantages. Physical realizability, reliability, and maintainability were considered to determine the practicality of a program to pursue development of a system conforming to that described. (Author)

AD-268 445 Div. 30, 8
(TISTW/DLW) OTS price $7.60

Nortronics Div., Northrop Corp., Anaheim, Calif.
TEST EQUIPMENT APPLICATION STUDY PROGRAM.
Final engineering rept.,
by J. H. Katsikas. 10 Mar 61, 68p. incl. illus. (NSS Rept. no. 887)
(Contract AF 33(604)29644)
Unclassified report

DESCRIPTORS: (Supply depots, *Test sets, Test equipment, Automatic, *Maintenance equipment, Test facilities, Electronic equipment, Military training, Military requirements.)

An objective study and analysis of 7 typical

electronic systems was made to determine the technical requirements for an automatic test system capable of performing maintenance evaluation of this equipment with a minimum amount of test equipment and personnel training. The 7 Air Force systems analyzed were: (1) AN/ALT-6B, (2) AN/ALT-59, (3) AN/APN-105, (4) AN/ARN-21, (5) AN/ARC-58, (6) AN/ARC-65, and (7) AN/USM-26. Test requirements and procedures were analyzed as a basis for establishing testing system performance specifications. Depot operation in terms of mission, facilities, and personnel were studied to determine automatic test system integration requirements. A model specification capable of automatic maintenance evaluation of the typical electronic systems was developed. (Author)

AD-268 466 Div. 30, 2
(TISTW/EET) OTS price $5.60

Massachusetts Inst. of Tech., Cambridge.
PRELIMINARY DESIGN STUDY FOR A DYNAMIC SOIL TESTING LABORATORY: APPENDIX B. SMALL-SCALE FOOTING STUDIES: A REVIEW OF THE LITERATURE,
by J. E. Roberts. July 61, 49p. incl. illus. tables, 47 refs.
(Contract AF 29(601)1947, Proj. 1080)
(AFSWC TR 61-48) Unclassified report

DESCRIPTORS: (*Bibliography on *Soils, Sand.) (*Laboratories for Soils, Tests.) (Soils, Sand, Friction, Stresses.) (Experimental data for Design of Soils, Laboratories, Tests, Test equipment, Civil engineering.) (Clays, Tests.)

A review is made of the literature on small-scale testing of footings on soil, particularly of efforts to determine the static ultimate bearing capacity. Literature published earlier than 1960 is discussed, while later reports are only listed in the bibliography. The review was performed as a part of a preliminary design study for a dynamic soil testing laboratory, and was intended to determine why some past efforts were worthwhile and others essentially worthless. It is concluded that the best success is achieved in nonquantitative verification of the modes of deformation and patterns of behavior, particularly of the size, shape, and presence of rupture zones. Good results are obtained from attempts to supplement established theories with empirical correction factors, but attempts to verify quantitative relationships or to establish numerical values have generally failed. (Author)

AD-268 467 Div. 30, 2
(TISTW/EET) OTS price $8.60

Massachusetts Inst. of Tech., Cambridge.
PRELIMINARY DESIGN STUDY FOR A DYNAMIC SOIL TESTING LABORATORY. APPENDIXES K, L, M, AND N.
Aug 61, 86p. incl. illus. tables, 4 refs.
(Contract AF 29(601)1947, Proj. 1080)
(AFSWC TR 61-58) Unclassified report

DESCRIPTORS: (*Laboratories for Experimental data on *Soils, *Sand.) (Design of Laboratories, Test equipment, Tests.) (Soils, Pressure, Sampling, Friction, Tests.) *Civil engineering.

Four laboratory experiments performed on small samples of soils are discussed. The experiments were designed to furnish certain information on soil behavior needed for the design of a dynamic soil testing laboratory. The four experiments studied friction angles of sands at low confining pressures, side friction in the consolidation test, failure conditions in hollow soil cylinders, and failures in tubes surrounded by soil. The apparatus and procedures used in each case are described, and typical data and results are presented. (Author)

AD-268 469 Div. 30, 1
(TISTW/EET) OTS price $3.60

Princeton U., N. J.
STUDY OF V/STOL AERODYNAMIC STATIC TEST FACILITIES,
by Henry E. Payne, III. May 61, 25p. illus. 35 refs. (Rept. no. 545)
(Contract DA 44-177-tc-524, Proj. 9-38-01-000, TK902)
Unclassified report

DESCRIPTORS: (*Short take-off planes for *Vertical take-off planes for Aerodynamic data, *Wind tunnels of Test facilities, Design, Feasibility studies.)

A study of the need for a new V/STOL Aerodynamic Test Facility was conducted. Discussions with industry and research laboratory teams confirm that accurate, reliable low-speed VTOL transition data are urgently required. It is shown that existing wind tunnels are unable to provide accurate V/STOL aerodynamic data. In addition, they are largely unavailable for industry design work and basic research. A large low-turbulence wind tunnel designed specifically to obtain VTOL transition test data is the best solution for future research needs. (Author)

AD-268 481 Div. 30, 8
(TISTE/CDM) OTS price $2.60

Radiation at Stanford, Palo Alto, Calif.
SUPER-POWER KLYSTRON TUBE-TEST FACILITY.
Quarterly rept. no. 4, 1 July-30 Sep 61,
by Roby L. Blessing. 30 Sep 61, 20p. illus.
(Rept. G-108-Q4)
(Subcontract to Varian Associates, Palo Alto, Calif.)
Unclassified report

DESCRIPTORS: (*Klystrons, Test equipment, *Test facilities, Construction.) (Pulse generators, Modulators, Modulator tubes, Magnets, Resistors, Switching circuits, Electron tubes, Pulse transformers, Transmission lines, Control systems, Production, Design.)

The design of system details associated with integration and installation of the system was completed. The system layout of the klystron tank was continued. The integration of all assemblies for on site installation is nearing completion. The test program includes the evaluation of 2 Machlett switch tubes under both high voltage and pulsed conditions. The interim modulator pulse transformers are being fabricated. Production engineering effort was placed

on completion of the mechanical details associated with the interim modulator, control console, input power control unit and pulse transformer tank. The klystron tank and system layout are under design. The preliminary design of the high-voltage transmission line was completed. A major portion of the system subassemblies was completed. The interim modulator items, with the exception of the trigger generator, are available for installation in the interim modulator cabinet. (Author)

AD-268 489 Div. 30, 5
(TISTB/MS) OTS price $6.60

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
THE RECOGNITION OF SPEECH BY MACHINE,
by George W. Hughes. 1 May 61, 62p. incl. illus. tables, 18 refs. (Technical rept. no. 395)
(Contract DA 36-039-sc-78108)
Unclassified report

DESCRIPTORS: (*Speech representation, *Speech, Pitch discrimination, Identification, Intelligibility, Automatic, Instrumentation, Test equipment, Computers.) (*Voice communication systems, Design, Coding, Language, Analysis.)

The problem of engineering a mechanical (automatic) speech recognition system is discussed in its theoretical and practical aspects. Performance of such a system is judged in terms of its ability to act as a parallel channel to human speech recognition. The linguistic framework of phonemes as the atomical units of speech, together with their distinctive feature description, provides the necessary unification of abstract representation and acoustic manifestation. A partial solution to phoneme recognition, based on acoustic feature tracking, is derived, implemented, and tested. Results appear to justify the fundamental assumption that there exist several acoustic features that are stable over a wide range of voice inputs and phonetic environments. (Author)

AD-268 491 Div. 30, 15, 12
(TISTP/WH) OTS price $5.60

RAND Corp., Santa Monica, Calif.
VARIATIONAL METHODS IN PROBLEMS OF CONTROL AND PROGRAMMING,
by Leonard D. Berkovitz. Dec 61, 46p. incl. 15 refs. (Rept. no. RM-2888-PR)
(Contract AF 49(638)700, Proj. RAND)
Unclassified report

DESCRIPTORS: (*Control systems, Synthesis, *Calculus of variations.) (*Programming, *Calculus of variations.)

It is shown how a fairly general control problem, or programming problem, with constraints can be reduced to a special type of classical Bolza problem in the calculus of variations. Necessary conditions from the Bolza problem are translated into necessary conditions for optimal control. It is seen from these conditions that Pontryagin's maximum principle is a translation of the usual Weierstrass condition, and is applicable to a wider class of problems than that considered by Pontryagin. The differentiability and continuity properties of the value of the control are established under reasonable hypotheses on the synthesis, and it is shown that the value satisfied the Hamilton-Jacobi equation. As a consequence, a rigorous proof of a functional equation of Bellman is obtained and is shown to be valid for a much wider class of problems than heretofore considered. A sufficiency theorem for the synthesis of control is also given. (Author)

AD-268 512 Div. 30, 8, 25
(TISTP/WH) OTS price $7.60

Remington Rand Univac Div., Sperry Rand Corp., St. Paul, Minn.
PROJECT LIGHTNING. VOLUME I.
Quarterly progress rept. no. 4, vol. 1 on Phase 3, 1 Mar-31 May 61.
31 May 61, 72p. incl. illus. tables (Rept. no. PX 1599-4)
(Contract NObsr-77521)
Unclassified report

DESCRIPTORS: (*Data processing systems, *Digital computers, Design, Films.) (*Memory devices, *Magnetic tape, Computer logic, Films, Ferromagnetic materials, Design.) (Circuits, Electronic circuits, Amplifiers, Transistors.)

Contents:
High speed memory
High speed memory stack design
June Demonstration Unit (JDU) sense line arrangements
Sense amplifiers
High level word translation
Search memory
Read circuits
Write circuits
Logic circuits
JDU clocking
JDU power
Transistor measurements
RCTL circuit
Logic circuit design

AD-268 513 Div. 30, 8, 25
(TISTM/EJH) OTS price $8.10

Remington Rand Univac Div., Sperry Rand Corp., St. Paul, Minn.
PROJECT LIGHTNING.
Quarterly progress rept. no. 4, vol. 2, 1 Mar-31 May 61 on Phase 3.
31 May 61, 76p. incl. illus. tables (Rept. no. PX 1599-4)
(Contract NObsr-77521; Continuation of Contract NObsr-72728)
Unclassified report

DESCRIPTORS: (Data processing systems, Data storage systems, Computer logic, *Digital computers, *Memory devices, *Magnetic cores, *Magnetic tapes, Ferromagnetic materials.) (Manufacturing methods, Processing, Magnetic tapes, Electrodeposition, Metallic smoke deposits, *Thin films, Glass, Metals.)

The study of the manner in which changes in vacuum deposition parameters affect magnetic properties of permalloy film cores resulted in increased knowledge of the effects of substrate temperature, substrate nature and cleaning, residual gas pressure, and rate of deposition. Improved deposition conditions yielded arrays with lower average values of H sub C (Coercivity), and H sub K (anisotropy field) and much lower ranges of magnetic properties. Film switching measurements continued to be used as a research tool in the investigation of the magnetic properties of thin films. A general review of the ferromagnetic resonance work is given. A 9-word, 16-digit search memory was evaluated; the readout pulse length could be reduced to 15 nsec without degrading the output signal. A possible mode of operation for the 24 x 24 shift matrix was developed. When 6 experimental 100-ma RCA germanium tunnel diodes were tested, their switching characteristics were nearly identical. Switching speeds ranged from 1.2 to 2 nsec. (Author)

AD-268 516 Div. 30, 17
(TISTM/EJH) OTS price $4.60

Watertown Arsenal Labs., Mass.
ELECTRIC FIELD ANALOGY OF CRACK WIDTH AND DEPTH EFFECT ON LEAKAGE FLUX IN FERROMAGNETIC MATERIALS,
by Patrick C. McEleney and J. Walter Bonanno.
Dec 61, 43p. incl. illus. tables, 6 refs.
(Rept. no. WAL TR 148.1/3)
(DA Proj. 5B93-32-004)
Unclassified report

DESCRIPTORS: (*Ferromagnetic materials, Magnetic materials, *Fracture (Mechanisms), *Non-destructive testing, Test methods, Electric fields, Magnetic fields.)

The flux distribution in the leakage field produced by 48 cracks of varying dimensions in magnetized ferromagnetic materials was determined by substituting an electric current for the magnetic flux and measuring electric potential in the vicinity of analogous flaws. By these analogous measurements it is shown that the peak flux density cannot be expected to be unique for both the width and depth of a crack but that the flux density is influenced by the specific defect dimensions. The total leakage flux is not unique for a particular crack depth but depends on the crack width as well. (Author)

AD-268 635 Div. 30, 3, 16
(TISTB/CCH) OTS price $18.50

Biological Labs., Frederick, Md.
MICROBIOLOGICAL SAFETY IN U.S. AND FOREIGN LABORATORIES,
by G. Briggs Phillips. Sep 61, 291p. incl. illus. tables, 88 refs. (Technical study 35)
(Proj. 4B11-05-015)
Unclassified report

DESCRIPTORS: *Microbiology, *Safety, *Biological laboratories, *Infections, Microorganisms, Handling.

A study of microbiological safety in 102 laboratories in 18 countries shows that methods used to control laboratory accidents and illnesses vary widely and that only a few laboratories are reasonably successful. Considering the various available approaches for improving safety in the handling of infectious microorganisms, there is need for critical experimental evaluation to determine under what conditions improvements are or are not desirable and the effectiveness of those changes made. Of special interest to the Department of the Army would be the ability of laboratories throughout the free world to operate safely with infectious microorganisms under non-peacetime conditions. Through continued analysis of the world-wide status of microbiological safety and through improved communications with foreign laboratories, the Biological Laboratories could gather information applicable in its safety program and make a significant contribution to the ability of other laboratories to safely carry out biological defense programs. (Author)

AD-268 643 Div. 30
(TISTB/LH) OTS price $6.60

Rand Corp., Santa Monica, Calif.
RESEARCH PROCEDURES IN MACHINE TRANSLATION,
by David G. Hays. Dec 61, 59p. incl. illus. refs. (Research memo. no. RM-2916-PR)
(Contract AF 49(638)700, Proj. RAND)
Unclassified report

DESCRIPTORS: (*Machine translation, Language, *Data processing systems, Coding, Theory.)

AD-268 696 Div. 30, 9
(TISTA/LSK) OTS price $5.60

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
THE DESIGN AND DEVELOPMENT OF A HELE-SHAW APPARATUS FOR FLOW VISUALIZATION.
Master's thesis,
by Henry James Mehserle. Aug 61, 42p. incl. illus. tables (Rept. no. GAE/AE/61-6)
Unclassified report

DESCRIPTORS: (Wind tunnel models, *Fluid flow, Mapping, Test equipment, *Wind tunnels, Simulation, Substitutes, Aeronautical laboratories, Design.) (Liquids, Water, Dyes, Injection, Fluid flow over Wind tunnel models, Photographic analysis.) (Fluid mechanics, Theses.)

A fluid flow mapper showing the exact solution of the two-dimensional potential flow streamline geometry about any arbitrary shape was constructed after the method of Hele-Shaw. Photographs were made of classical aerodynamic flow fields and an analysis to predict two-dimensional wind-tunnel boundary effects on streamline curvature was made. The application of potential flow theory to two-dimensional steady heat transfer was considered. (Author)

AD-268 698 Div. 30
(TISTB/MS) OTS price $1.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
DIVISION 5. INFORMATION PROCESSING.
Quarterly progress rept., 1 Sep-30 Nov 61.
15 Dec 61, 12p. 11 refs.
(Contract AF 19(604)7400)
(AFESD TN 61-1026) Unclassified report

DESCRIPTORS: (*Data processing systems, *Digital computers, *Computers, Memory devices, Circuits, Analog-to-digital converters, Design, Magnetic materials, Films.) (Psychology, *Speech, Automatic, Speech representation.) Mathematical analysis.

AD-268 700 Div. 30, 25
(TISTP/FR) OTS price $.75

F and M Scientific Corp., New Castle, Del.
THE DEVELOPMENT OF A HIGH TEMPERATURE (1000 DEGREES C) GAS CHROMATOGRAPH.
Rept. for Apr 60-Mar 61 on The Chemistry and Physics of Materials,
by Charles B. Euston and Aaron J. Martin.
June 61, 21p. incl. illus. tables.
(Contract AF 33(616)7160, Proj. 7360)
(WADD TR 61-176) Unclassified report

DESCRIPTORS: (Gases, Analysis, *Chromatographic analysis, *Electrochromatography, High temperature research, *Instrumentation.) (Flames, Hydrogen.) (Induction heating, Power transformers.) (Ionization, Detectors.)

A gas chromatograph operable at temperatures to 1000 C is described. Featuring either isothermal or linear programmed temperature operation, the unit utilizes a novel integrated column and hydrogen flame ionization detector for sensitivity and stability. The stainless steel column is heated by passing high currents (to 120 amperes) directly through the metal. Other wrapped heater columns may also be used. Design considerations, descriptive information and performance data for the instrument are presented. Organic analysis presents no problem, and the detection of organo-metallic compounds appears straight forward. Application to inorganic chloride salts has given anomalous results. The data indicate that reaction of the sample is the primary cause of this behavior, and that proper choice of column materials and sampling techniques will be required for these analyses. (Author)

AD-268 703 Div. 30
(TISTP/FR) OTS price $1.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
SEMI-AUTOMATIC RANDWORD PRINTED CIRCUIT TESTER,
by Charles A. Hoover. 27 Nov 61, 7p. illus. 2 refs. (Rept. no. 25G-7)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: (Electronic equipment, *Printed circuits, *Test equipment.)

A portable semi-automatic tester forchecking RANDWORD printed circuit packages by subjecting them to conditions similar to those encountered in a system or other equipment is described. In this way, circuits suspected of improper operation can be tested immediately and set aside if found faulty. (Author)

AD-268 704 Div. 30, 6
(TISTP/FR) OTS price $1.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
MATCHING AND ERROR COUNTER,
by Lee D. Staaf and Erhard J. Hofmann.
5 Dec 61, 6p. illus. (Rept. no. 25G-6)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: (Data transmission systems, *Telemetering data, Errors, *Test equipment.) (Pulse counters, Timing circuits, Printed circuits.)

The matching and error counter described was expressly designed to be used with the data transmission equipment supplied to Project MIDAS. The purpose of this counter is to compare the transmitted signal with a reference source signal of the same time base and record sync and data errors. In addition, the matching and error counter will record a loss or dropout of the timing signal. This system uses a tuning fork as a timing reference to record signal dropouts. (Author)

AD-268 733 Div. 30, 8
(TISTW/DLW) OTS price $3.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
HIGH POWER MICROWAVE ELECTRONICS.
Technical note,
by John W. E. Griemsmann. 2 Oct 61, 19p. illus. 8 refs. (Rept. no. PIBMRI-947-61)
(Contract AF 30(602)2135)
(RADC TN 61-214)
Unclassified report

DESCRIPTORS: (*Test facilities, Radiofrequency power, Power supplies, *Power amplifiers, Cavity resonators, Microwaves, *Magnetrons, *Klystrons, *Waveguides, Microwave equipment, Electronic circuits, Ferrites, *Electronic switches, X band, C band, Design.) (Dielectrics, Materials, Test equipment.)

Progress in the build-up of a high microwave power facility culminating in a 10 megawatt peak power C-band klystron system is reported. Details are given on the design considerations for a C-band peak power enhancement device (traveling wave resonator) capable of boosting high peak powers by a large factor and making it available for use with an external load. Approaches to the microwave switching problem are discussed and progress reported on work toward a suitable switch. Results are given for a prototype low-power X-band dischargeable resonator about 1000 wavelengths long from which enhanced pulsed power was extracted by means of a fast ferrite switch. Work is also described on the design of a test cell for subjecting materials to high power densities. (Author)

AD-268 742 Div. 30
(TISTW/EET) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
STAR CATALOGS ON PUNCHED CARDS AND MAGNETIC TAPE,
by J. H. Berbert. Dec 61, 6p. incl. illus. tables. (NASA Technical note D-1153)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1153.

DESCRIPTORS: (*Satellite vehicles, *Tracking, Radio interferometers, Stars, Data processing systems, Punched card methods, Magnetic tape.) (Stars, Catalogs, *Punched card methods.) (Radio interferometers, Calibration by Correlation techniques.)

In connection with the calibration of the Minitrack satellite tracking stations, the Goddard Space Flight Center has had the contents of a number of star catalogs put on punched cards and magnetic tape. This report discusses the plate data reduction procedures, briefly describes the information on the punched cards and magnetic tape, and calls attention to other applications of the card and tape star catalogs. The Goddard Space Flight Center has offered to prepare duplicate catalogs for qualified organizations. (Author)

AD-268 771 Div. 30
(TISTE/NTM) OTS price $4.60

Space Technology Labs., Inc., Los Angeles, Calif.
RESEARCH ON LOW TEMPERATURE COMPUTING ELEMENTS.
Annual summary rept., 30 Sep 60-30 Sep 61.
30 Sep 61, 40p. incl. illus. 8 refs. (Rept. no. 8971-0046-RU-000)
(Contract Nonr-254200)
Unclassified report

DESCRIPTORS: (Low temperature research, *Computers, Superconductors, Thin films, *Electronic circuits, *Trigger circuits.) (Evaporation, *Cryogenics, Superconductivity.) (Polymers, Insulating materials, Films.) (Metal films, Electron bombardment.) (*Memory devices, Circuits, Design.)

Research was carried out in 7 different areas. These include a solution of the London Equations for thin films, development of evaporation techniques, studies of polymer insulating films, fabrication and tests of thin film flip-flops, deposition of metal films by electron bombardment, design of a large circuit evaporator, and further development of the associative memory design. The evaporation studies led to a considerable improvement in the reproducibility of cryotrons. The polymer insulating film is now used in all superconducting devices fabricated in the program. A number of superconducting flip-flops were fabricated, the most recent of which has a reversal time of 35 nanoseconds. The considerable improvement in reproducibility of cryotrons and polymer insulation made it feasible to proceed to develop equipment for production of dense circuits of up to 1000 cryotrons on 10 sq in. of substrate. A large circuit evaporator with this capability was designed. Fabrication and tests of various high density masks suitable for producing 100 cryotrons/sq in. are currently under way. (Author)

AD-268 865 Div. 30
(TISTP/MFA) OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
AUTOMATING THE INTRODUCTION OF CERTAIN TYPES OF DATA INTO A COMPUTER (Ob Avtomatizatsii Vvoda Nekotorykh Vidov Dannykh V Vychislitel'Nuyu Mashinu),
by V. S. Fayn. 6 Dec 61, 7p. incl. illus. 5 refs.
(Trans. no. FTD-TT-61-69 of Avtomatika i Telemekhanika 22:536-538, 1961)
Unclassified report

DESCRIPTORS: (*Digital computers, *Automation, Data, Theory, Memory devices, Coding, Switching circuits, Data processing systems.)

A method is discussed for automatically transforming functions, given in form of graphs, oscillograms or other visible images into numerical (table) form. This secures the possibility of directly utilizing the obtained data on digital computers for solving many problems e. g. for finding interpolation polynomials, for making numerical integration and differentiation, solving many differential equations, etc. When solving these or other problems on automatic digital computers there is a need of reducing the data fed into the machine into table form. If these data have the initial form of graphs, oscillograms, photos, then the procedure of transforming same into table form as assigned by the man-operator consumes much time, which may appear to be nonpermissible at the existing tendency of increasing the rate of calculating. It is therefore advisable to examine the possibility of automating the transformation of data from graphic into table form. (Author)

AD-268 888 Div. 30, 25
(TISTP/MFA) OTS price $3.60

Minnesota U., Minneapolis.
MEASUREMENT OF DISPLACEMENTS IN CONTACT-STRESS EXPERIMENTS.
Rept. for 1 Jan 60-30 June 61 on Metallic Materials,
by G. E. Bowie. Oct 61, 32p. incl. illus. tables, 10 refs.
(Contract AF 33(616)6828, Proj. 7351)
(ASD TR 61-450) Unclassified report

DESCRIPTORS: (Instrumentation, Measurement, Test equipment, *Stresses, *Deformation, Energy, *Strain gages, Load distribution.) (Measurement, Calibration, Transducers, Interferometers, Piezoelectric effect, Machines, Optical systems.)

A major part of the instrumentation for contact-stress investigations being carried out at the University of Minnesota has the function of providing displacement measurements in the micro-inch range. A modified phonograph-type displacement pickup and an interferometer for calibrating it are described. In addition, there are described a piezoelectric driving transducer used to load spheres upon which experiments are performed, a capacitance-type displacement pickup, and modifications of an Instron testing machine upon which the apparatus is mounted. (Author)

AD-268 894 Div. 30, 17, 8
(TISTM/REB) OTS price $1.75

Automation Industries, Inc., Boulder, Colo.
INVESTIGATION OF METHODS FOR DETERMINING ACTUAL FLAW SIZE IN MATERIALS BY NONDESTRUCTIVE ULTRASONIC MEANS.
Rept. for 15 May 60-1 May 61 on Materials Application,
by Leo J. Anderson and Gerald J. Posakony.
Sep 61, 53p. incl. illus.
(Contract AF 33(616)7279, Proj. 7381)
(ASD TR 61-205) Unclassified report

DESCRIPTORS: (*Instrumentation, *Nondestructive testing, Ultrasonics, Test equipment, Design.) (Deformation, Welds, Materials, Metals.) (Electronic equipment, Transducers.)

Applied research was conducted to determine methods of analyzing ultrasonic reflections from material discontinuities; and further, to develop breadboard prototype electronic instrumentation to produce a 3-dimensional isometric projection of internal discontinuities in their true perspective using a single transducer system. Emphasis was on development of a new concept of presentation of data. This new concept involved display of information as a function of the sound beam properties propagated in the material. A special transducer manipulator was designed to provide the required sound beam action to view internal discontinuities from all angles. This contract has proven the practicality of using a single oscillating transducer scanning system. (Author)

AD-268 900 Div. 30, 1, 2, 8, 9, 15, 16 17, 25, 28
(TISTA/LSK) OTS price $5.00

Herner and Co., Washington, D. C.
BASIC RESEARCH RESUMES 1960. A SURVEY OF BASIC RESEARCH ACTIVITIES IN THE OFFICE OF AEROSPACE RESEARCH.
1961, 389p.
(Contract AF 49(638)903)
(AFOSR-925) Unclassified report

DESCRIPTORS: (*Air force research, *Astronautics, *Bibliography.) Chemistry, Metallurgy, Physics, Electronics, Optics, Electromagnetic fields, Electromagnetic waves, Mathematics, Astrophysics, Astronomy, Cosmic rays, Meteorology, Psychology, Space medicine, Medicine, Fluid mechanics.

Division 30-RESEARCH AND RESEARCH EQUIPMENT

The purpose of this second Basic Research Resumes is to promote the broad accessibility of information about fundamental research projects supported by the Air Research and Development Command. The volume is a by-product of a research project whose purpose is the comparative study of indexing systems for scientific information. The subject index used is a working example of one means of organizing highly technical information for search and retrieval. It utilizes a system involving the permutation of key terms in phrases describing the content of documents, or, as in the present case, project outlines. The descriptive phrases, drawn directly from the texts of the project outlines, give as specifically as possible the subject of the work done, and where applicable the method used. Since there, as a rule, as many descriptive phrases per project outline as there are major subjects discussed, there is an unusual depth and informativeness of index entry. The effectiveness and look-up flexibility of this form of entry are enhanced by the permutation of key terms within descriptive phrases. (Author)

AD-268 904 Div. 30, 4, 25
(TISTM/REB) OTS price $1.25

Laboratories for Applied Sciences, U. of Chicago, Ill.
SURFACE RECOMBINATION OF MOLECULAR FRAGMENTS. Rept. for 1 July 58-31 Aug 60 on Surface and Interface Phenomena Matter,
by L. De Vaux, R. Gabriel and others. June 61, 35p. incl. illus. tables, 3 refs.
(Contract AF 33(616)5976, Proj. 7022)
(WADD TR 60-928) Unclassified report

DESCRIPTORS: (Molecular beams, Bombardment, Surfaces, Chemical reactions, *Recombination reactions.) (Instrumentation, *Mass spectrometers, Particle accelerators.) (Free radicals, Atoms, Ions.)

Experiments are being undertaken to study the reactions that occur when free radicals, atoms, or ions impinge upon various types of surface. A molecular beam containing free radicals, etc., is to impinge upon a prepared surface and the reaction products that are reflected or evaporated from the test surface are to be analyzed by means of an analytical mass spectrometer. Conditions will be such that the analysis is uncomplicated by reactions in the gas phase or at walls of the apparatus. The instrumentation that has been designed and constructed for the experiments is described. (Author)

AD-268 915 Div. 30, 25
(TISTP/MFA) OTS price $7.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
CONSIDERATIONS ON THE OPTICS OF THE INTEGRATING SCHLIEREN INSTRUMENT,
by P. C. T. de Boer and J. M. Burgers. Sep 61, 66p. illus. 4 refs. (Technical note no. BN-258)
(Contract AF 49(638)401)
(AFOSR-1857) Unclassified report

DESCRIPTORS: (Optics, *Optical equipment, Light transmission, Brightness, Refractive index, Schlieren photography, *Analysis, *Tests.) (Instrumentation, Photomultipliers, Collimators, Lenses, Shock tubes, Oscillographs.) (Mathematical analysis, Perturbation theory, Continuum mechanics, Functions.)

An analysis is presented of the optics encountered in the integrating schlieren arrangement as first described by Resler and Scheibe. Expressions were developed for the signal which will be received on the photomultiplier, both for the instrumentation using an inclined knife edge and for that which uses a vertical knife edge. Attention is given to the conditions which must be satisfied to guarantee that the response of the photomultiplier shall be proportional to the difference in refractive index at the beginning and the end of the test section. The signal to be expected in the case of a sudden discontinuity in refractive index, which is partly reflecting, partly transmitting, was calculated and is compared with the signal obtained with a continuous change of refractive index. Throughout the analysis it is supposed that lens aberrations can be neglected and that diffraction phenomena may be left out of account. (Author)

AD-268 917 Div. 30, 15
(TISTP/MFA) OTS price $1.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
NON-LINEAR REGRESSION WITH MINIMAL ASSUMPTIONS,
by Harvey M. Wagner. 30 Nov 61, 10p. 5 refs.
(Technical rept. no. 99)
(Contract Nonr-22550, Proj. NR-047-044)
Unclassified report

DESCRIPTORS: (*Non-linear systems, Computers, Theory, *Linear programming, Scheduling, Least squares method.) (Transformations (Mathematics), Statistical analysis.)

A curvilinear regression model of computer theory is treated by linear programming methods, so as to require only mild restrictions on the nature of the non-linearities. (Author)

AD-268 930 Div. 30, 15, 22
(TISTB/MS) OTS price $1.60

Operations Research, Inc., Silver Spring, Md.
COMMENTS ON THE ALGOL PROGRAM,
by Reynold Greenstone. 26 Dec 61, 13p. 1 ref.
(Suppl. to Technical rept. no. 148, vol. 2, AD-267 379)
(Contract DA 18-108-cml-6554)
Unclassified report

DESCRIPTORS: (*Digital computers, Programming, Coding, Language, Mathematical computer data, Data processing systems.) (*Targets, Exterior ballistics, Fragmentation, *Impact computers, Target plotters.)

AD-268 940 Div. 30, 12
(TISTW/DLW) OTS price $9.60

Rand Corp., Santa Monica, Calif.
OPERATIONAL CRITERIA FOR THE DESIGN OF MISSILE READINESS TESTING PROGRAMS AND EQUIPMENT,
by J. R. Brom and S. I. Firstman. Dec 61, 106p. incl. illus. tables, 18 refs. (Rept. no. RM-2735-PR)
(Contract AF 49(638)700, Proj. Rand)
Unclassified report

DESCRIPTORS: (*Test sets, Test equipment, *Maintenance equipment, Automatic, *Ground support equipment, Launching sites, Test facilities, Effectiveness, Military requirements.) (*Guided missiles, Re-entry vehicles, Guidance, Control systems, Electronic equipment, Electrical equipment, Reliability, Test methods.)

The increasing complexity of modern weapons and the growing importance of their near-instantaneous readiness for action have forced development of very rapid readiness testing procedures, which of necessity, had to be at least partially automated for speed. Because much of the automatic checkout equipment (ACE) was developed to meet immediate needs, without careful integration of its design with that of the prime equipment and ground support equipment, technical misfits and inefficiency have resulted. It is demonstrated how missile readiness (the probability that the missile is operative and ready to launch at any future time) is influenced by equipment, weapon systems, and operational factors. An effective readiness testing program is also studied for each component, and hence for the entire missile or weapon system. A mathematical model is developed that relates missile readiness to relevant physical and operational factors. (Author)

AD-268 971 Div. 30, 8, 5
(TISTW/DLW) OTS price $2.60

Armour Research Foundation, Chicago, Ill.
INSTRUMENTATION AND MEASUREMENT TECHNIQUES STUDY.
Quarterly rept. no. 11, 1 Aug-31 Oct 61, by T. A. Jackson. 31 Oct 61, 21p. incl. illus. (Rept. no. ARF 5112-Q11)
(Contract DA 36-039-sc-78269, Proj. 3G89-01-021-01)
Unclassified report

DESCRIPTORS: (*Test sets, Test equipment, Test methods, Measurement, Test facilities, Military equipment, Electronic equipment, Design.) (Printed circuits, Electronic circuits, Signal generators, Test equipment, Tests.) Field wire communication systems.

A technique for isolating a circuit fault in a printed circuit board is described. A current transformer permits current measurement in any one of several parallel branches. The behavior of a spiral-four line containing repeaters, and having a fault at some point is discussed. Pulse reflection fault location techniques are examined. Presently known methods of SSB signal generation are outlined, and associated problems are discussed. An approach is selected which should minimize intermodulation distortion. The proposed system uses Hall-effetct multipliers in the phase-shift unit, and breadboarding of the system is partially complete. (Author)

AD-268 972 Div. 30
(TISTP/JW) OTS price $3.60

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
NEURISTOR CIRCUITS TO ACCOMPLISH SOME DIGITAL COMPUTER OPERATIONS.
Master's thesis,
by William Carroll Ross. Aug 61, 33p. incl. illus. (Rept. no. GA/EE/61-4)
Unclassified report

DESCRIPTORS: (*Pulse generators, Sequences, *Digital computers.) (Mathematical analysis, Mathematical computer data.) Refraction, Computer logic.

Digital computer circuits were constructed using neuristors. A neuristor is a one-dimensional channel along which pulses may propagate, the pulses taking the form of propagating discharges having the following properties: threshold stimulability, attenuationless propagation, uniform velocity of propagation, and refractive period following the passage of a discharge past any point of a channel. Two neuristor pulse sequences representing binary numbers are fed simultaneously into a neuristor add circuit; a pulse sequence emerges which represents the sum of the two pulse sequences. Similar circuits are developed for subtraction, multiplication, division and other elementary operations. (Author)

AD-268 992 Div. 30, 14
(TISTM/TCG) OTS price $1.25

Armour Research Foundation, Chicago, Ill.
ULTRASONIC METHODS FOR NONDESTRUCTIVE EVALUATION OF CERAMIC COATINGS.
Rept. for 1 Mar 60-29 Feb 61 on Materials Analysis and Evaluation Techniques, by W. E. Lawrie. Apr 61, 42p. incl. illus.
(Contract AF 33(616)6396, Proj. 7360)
(WADD TR 61-91, pt. 1) Unclassified report

DESCRIPTORS: (*Ceramic coatings, *Refractory coatings, Metals, Alloys, Bonding, Failure (Mechanics), *Ultrasonics, Test methods, *Nondestructive testing, Instrumentation.) (Zirconium compounds, Oxides, Enamel coatings on Steel, Chromium plating on Molybdenum.) High frequency, Low frequency, Energy.

Investigations into the use of ultrasonics to detect defects in ceramic-metal bonds and to measure the strengths of the bonds are described. In the techniques, ultrasonic frequencies from 30 cps to 35 mc/sec were used and in one method 2 frequencies are used simultaneously. Low frequency energy (14 kc/sec) was successfully used to detect defects by decrement measurements. Low frequencies were used in further studies of the intermodulation method to locate regions of bonds in which defects are present. High frequencies, up to 35 mc/sec, were used with a transmission method and visual images of defects are displayed using a simple charge scanning technique. High frequency energy was also used in the form of surface waves. (Author)

31. SHIPS AND MARINE EQUIPMENT

AD-268 280 Div. 31, 9
(TISTE/CRJ) OTS price $5.60

St. Anthony Falls Hydraulic Lab., U. of Minn., Minneapolis.
INTERFERENCE EFFECTS OF A STRUT ON THE LIFT AND DRAG OF A HYDROFOIL,
by J. F. Ripken. Aug 61, 45p. incl. illus. table, 5 refs. (Proj. rept. no. 65)
(Contract Nonr-71039, Proj. SF 013 02 01)
Unclassified report

DESCRIPTORS: (*Hydrofoil boats, *Hydrofoils, *Hydrodynamics, Aerodynamics, Yaw, Lift, drag, Pressure, Test methods, Measurement.)

The evaluation of performance characteristics of hydrofoil systems employed to support waterborne craft commonly makes use of two-dimensional

foil section analysis. Such evaluations are currently in need of more data for handling the contributions of the surfaces in the vicinity of the strut-foil junction where three-dimensional flow-interference effects occur. In this study, towing tank tests were used to evaluate the influence of interference on the lift and drag of selected models of common junction conditions under a variety of submergence, attack, and yaw conditions. The evaluation was made from pressure distribution measurements. (Author)

AD-268 448 Div. 31, 30
(TISTE/CDM) OTS price $5.60

Naval Submarine Base, New London, Conn.
ELECTRONIC INSTRUMENTATION FOR SUBMARINE AUXILIARY MACHINERY NOISE AND VIBRATION CONTROL, by Robert York Chapman. 1 Oct 61, 48p. incl. illus.
(Technical rept. no. 210-61)
Unclassified report

DESCRIPTORS: (*Submarines, Auxiliary power plants, Noise, Attenuation.) (*Test sets, Test equipment, *Submarine noise, Vibration, Measurement.) (Electronic equipment, Instrumentation, Instruction manuals.)

A study was made of noisy machinery which is an undesirable source of acoustic radiation and vibration. Waterborne acoustic radiation greatly increases the detectable range. With increasing demands for quiet performance by the Thresher and Tullibee class of submarines, and even more stringent requirements of the SSB(N)'s, quality control work in repair shops has become a must. Inspection and evaluation of the rotating machinery overhaul work done by forces afloat now have to meet recommended prescribed noise and vibration limits. These recommended prescribed limits, measured in acceleration, velocity and displacement decibels and obtained by electronic instrumentation measurements, are called the Chapman numbers, an accepted guide and standard for submarine auxiliary machinery performance, relative to rotational balance and noise levels. (Author)

AD-268 498 Div. 31, 33
(TISTE/NTM) OTS price $3.60

Army Transportation Research Command, Fort Eustis, Va.
OPERATIONAL GUIDE FOR LAUNCHING THE LCM-8, by Rocco Fama and John Newman. Dec 61, 32p. incl. illus. (Research technical memo. 34; TCREC technical rept. 61-136)
(Proj. no. 9R98-05-009)
Unclassified report

DESCRIPTORS: (*Landing craft, Launching from Ship decks, Test methods.) (Cargo ships, Ships, Military operations, *Water entry, Impact shock.)

Methods and equipment used to launch a landing craft (LCM-8) from a height of approximately 20 feet above the water at an angle of 12-1/2 degrees are described. The procedure can be used as a guide for the execution of future tests of a similar nature; it can also be adapted to the discharging of landing craft from the decks of cargo vessels in an oversea area. The procedure is based on the experience gained from several test launchings. It was found to be economical of time, funds, and personnel, and is consistent with safe operational practices. Drop tests in which this procedure was used have proved that an LCM-8 in good operating condition can be dropped with no resulting damage from a height of approximately 20 feet. (Author)

AD-268 905 Div. 31, 22
(TISTW/EET) OTS price $3.60

David Taylor Model Basin, Washington, D. C.
THE RESPONSE OF SHIPS TO UNDERWATER EXPLOSIONS, by A. H. Keil. Nov 61, 35p. incl. illus. tables, 24 refs. (Rept. no. 1576)
Unclassified report

Reprint of paper presented at the Annual Meeting, Society of Naval Architects and Marine Engineers, 16-17 November 1961, New York, N. Y.

DESCRIPTORS: (*Ships, *Ship hulls, *Underwater explosion damage.) (Naval vessels, *Underwater explosions, Structures to Torpedo damage, Ammunition damage.) (Vulnerability of Ship hulls.) Underwater explosions, Explosion bubbles, Shock waves, Analysis.

Various phases of an underwater explosion are described. Nomograms are given for characteristics parameters of the shock wave and the bubble pulsation. Possible effects of the water surface and the sea bottom are discussed. Characteristic ship-response phases are reviewed and explained. They are demonstrated by actual examples of hull response and hull damage. The shipboard shock environment to which any installation aboard a ship is subjected is presented, and typical cases of shock damage are shown. The significance of the study of ship response to underwater explosions is reviewed. Generalization of the few controlled explosion tests against ships becomes possible by application to loading and response theories. The foundation is thus laid for increasing the combat reliability of ships and their endurance under attack. (Author)

32. MISCELLANEOUS ARTS AND SCIENCES

AD-268 165 Div. 32, 15
(TISTB/MS) OTS price $2.60

Quartermaster Corps., Washington, D. C.
REVIEW OF THE HARBRIDGE HOUSE TREATMENT OF INVENTORY POLICY AT THE NATIONAL LEVEL, by Andrew C. Stedry. Nov 61, 22p. incl. tables.
(Operational mathematics series rept. no. 7)
Unclassified report

DESCRIPTORS: (*Economics, *Supplies, Distribution, *Mathematical analysis.)

As a part of their extensive contractual effort in the area of economic inventory policies (EIP), Harbridge House of Boston, Massachusetts, studied inventory policies at the national or wholesale level. It was found that though the determination of operating levels is adequate, their approach to the determination of safety levels has several flaws making their recommended determination of safety levels inadequate. Mathematical arguments are given for this criticism. Since acceptable alternative approaches are available, it is suggested that these be used to determine national inventory policies. (Author)

AD-268 365 Div. 32, 15
(TISTB/MS) OTS price $11.50

Applied Mathematics and Statistics Labs., Stanford U., Calif.
PRIMARY PRODUCTION AND ECONOMIC DEVELOPMENT,
by Munidasa Chandrasoma Kodikara. 28 Nov 61, 150p. incl. tables, 60 refs. (Technical rept. no. 98)
(Contract Nonr-22550, Proj. NR 047-004)
Unclassified report

DESCRIPTORS: (*Economic conditions, *Economics, *Production, *Costs, Mathematical analysis.) (*Foreign policy, Commerce, Growth.)

AD-268 732 Div. 32, 12
(TISTA/SEB) OTS price $1.10

Polytechnic Inst. of Brooklyn, N. Y.
(No title).
Final rept.,
by Antonio Ferri. 31 Oct 61, 7p. (PIBAL rept. no. 735)
(Contract DA 30-069-ORD-2346)
(AROD rept. no. 2208:3)
Unclassified report

DESCRIPTORS: (*Astronautics, Education, Universities.)

A study in space technology was aimed at establishing a coordinated and advanced course of studies whereby the astronautical engineer and applied scientist could obtain advanced training and up-to-date information in the many scientific areas basic to current sophisticated research and design activities. The aims have been fulfilled successfully; as a result complete curricula have been instituted leading to the degrees of Master of Science and Doctor of Philosophy in Astronautics. An outline of these curricula and of the supporting academic and research effort is presented here. (Author)

AD-268 918 Div. 32, 15
(TISTB/MS) OTS price $1.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
LONG TERM-PRICE ADJUSTMENT IN A TWO-SECTOR HARROD GROWTH MODEL,
by Mordecai Kurz. 4 Dec 61, 15p. (Technical rept. no. 100)
(Contract Nonr-22550, Proj. NR-047-004)
Unclassified report

DESCRIPTORS: (*Economics, Growth, *Mathematical analysis, *Mathematical prediction, Theory.)

A simplified model that reflects Harrod's view of the world is presented. The natural (n) and warranted (k) rates of growth are defined as follows: (1) full employment equilibrium can exist even if n and k are not equal; (2) if the natural rate of growth is lower than the warranted rate of growth there will have to be a long term decline in the price of capital, a long term increase in the wage rate and a constant interest rate but lower than the rate of return on capital. When n is greater than the converse will have to happen; (3) the peculiarity of the equilibrium is that it places the system on a terminal path automatically. For any initial conditions (satisfying the equilibrium condition (11)) the system is placed on a terminal path whose level is obviously not unique; and (4) an increase of the savings ratio will increase the rate of growth of output. Acceleration of the rate of growth of output by raising k may lead to a negative interest-rate which may cause a constant inflation in an expanded model which contains a financial structure. (Author)

AD-268 919 Div. 32, 15, 28
(TISTB/MS) OTS price $3.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
THE ECONOMIC IMPLICATIONS OF LEARNING BY DOING,
by Kenneth J. Arrow. 7 Dec 61, 30p. 16 refs.
(Technical rept. no. 101)
(Contract Nonr-22550, Proj. NR-047-004)
Unclassified report

DESCRIPTORS: (*Economics, *Mathematical prediction, *Mathematical analysis of Production, Growth by Learning, Education.) (*Economic conditions, Analysis, Theory.)

33. TRANSPORTATION

No Entries

NON-MILITARY AND OLDER MILITARY RESEARCH REPORTS

*Descriptors marked with an asterisk are included in the subject index.

AGRICULTURE

PB 159 282 $6.60

Army [Cold Regions Research and Engineering Lab.] Wilmette, Ill.
PHOTO-INTERPRETATION OF VEGETATION. LITERATURE SURVEY AND ANALYSIS, by Virginia P. Finley. Rept. on Photographic Interpretation Techniques, General. July 60, 65p. 266 refs. Technical rept. 69.

DESCRIPTORS: *Plants, Physical properties, Photographic analysis, *Aerial photography, Photographic intelligence, Bibliography.

The results of a literature survey on the applicability, capabilities, and limitations of existing airphoto interpretation techniques in determining certain physical properties of vegetation are reported. The interpretation of tree and scrub stands is emphasized, with special attention given to measurements of trunk diam and spacing, canopy height and coverage, density and height of undergrowth, and type of foliage. The accuracy of measurements are examined with respect to scale, photo characteristics, seasonal effects, and light conditions. Photographic factors affecting vegetation images, vegetation characteristics obtainable from aerial photographs, and vegetation identification and its significance as an indication of terrain conditions are discussed. The appendices contain information relative to type of photography, instrumentation, species identification, physical characteristics of vegetation, and vegetative keys used in the various literature sources studied. (Author)

ASTRONOMY

UCRL-6487 $1.00

Lawrence Radiation Lab., U. of California, Livermore.
A FEASIBILITY STUDY OF A METHOD TO ANALYZE THE MOON'S SURFACE USING NUCLEAR INELASTIC SCATTERING, by Robert J. Stinner. Rept. on Contract W-7405-eng-48. May 61, 46p.

BEHAVIORAL SCIENCES

PB 158 068 $2.60

Washington U., St. Louis, Mo.
ON DEFINITIONS AS GUIDES TO MEASUREMENT, by Robert L. Hamblin. Technical rept. 6 on Contract Nonr-816(11). Nov 60, 27p. 18 refs. AD-248 528.

DESCRIPTORS: *Sociometrics, Measurement, Theory, Reliability, Social sciences, *Philology, *Language.

The problem of obtaining definitions which can serve as reliable guides for operationalizing conceptual variables both in testing and applying theory was investigated. By borrowing from the philosophers of science and codifying some of the experience of experimental sociologists, a number of procedures were outlined for obtaining fundamental definitions of conceptual variables. The procedures were chosen with the explicit purpose of maximizing the epistemic functions of the definitions. Thus, fundamental definitions were developed for use as guides in operationalizing conceptual variables. Ultimately, the fundamental definition, as specified by the suggested procedures, must be evaluated in terms of reliability. When similar procedures are used on the similar problems of interobserver reliability in interaction experiments, or intercoder reliability in content analysis, reliability exceeding .90 is routine. The implication is that while the present formulation of procedures for obtaining fundamental definitions may not result routinely in acceptable reliability in independent measures, it is probable that some revision or extension of these procedures may result in such reliability. (Author)

PB 158 623 $5.60

Yale U., New Haven, Conn.
EXPERIMENTS ON DECISION MAKING AND OTHER STUDIES, ed. by Donald W. Taylor. Technical rept. 6 on Contract Nonr-609(20). Dec 60, 60p. 25 refs. AD-253 952.

DESCRIPTORS: *Reasoning, Behavior, Needs, *Reaction (Psychology), Anxiety, Tests.
Contents:
Amount and generality of information-seeking behavior in sequential decision making as dependent on level of incentive, by Donald R. Worley
Maximization of utility in economic decisions under risk, by Earl B. Hunt
Group and individual economic decision making in risk conditions, by E. B. Hunt and R. R. Rowe
Information seeking in sequential decision making as dependent upon test anxiety and upon prior success or failure in problem solving, by John S. Roberts, Jr.
Two exploratory studies of the effect of separation of production from evaluation of ideas, by David L. Singer
A note on the reliability of five rating scales, by Donald W. Taylor

Personnel and Training

AD-259 476 $9.60 Not announced by ASTIA

Human Resources Research Office, George Washington U., Washington, D. C.
A SYSTEMATIC ANALYSIS OF ARMY TRAINING REQUIREMENTS AS THE BASIS OF MORE GENERALIZED TRAINING RESEARCH, by Francis E. Jones. Rept. on Contract DA 49-106-qm-1. May 61, 113p. 13 refs. Research rept. 7.

DESCRIPTORS: *Military training, *Military research, *Military requirements, Education, Theory, Analysis

The training requirements of 519 Army jobs contained in The HumRRO Training Analysis Directory were reduced to the more elementary components of "subject matter," "subject-matter modifiers," and "porficiencies involved." Next, "basic ideas," representing potential generalized training areas, were derived by a process of determining the systemic generality of various sub-components of the training requirements. Finally, from a single idea, TECHNIQUES/PROCEDURES/METHODS, a model was constructed to illustrate the actions and interactions of various factors within the performer as they affect his performance of a given task for which he is trained. Practical examples of the application of the TPM analysis to command decisions were given. (Author)

PB 154 214 $2.60

Naval School of Aviation Medicine, Pensacola, Fla.
THE EFFECTIVENESS OF THE PRE-FLIGHT REMEDIAL MATHEMATICS COURSE, by Anton S. Morton. 15 Aug 59, 21p. Special rept. no. 59-8; AD-230 823.

DESCRIPTORS: *Mathematics, *Military training, *Naval personnel, Personnel, *Achievement tests, Effectiveness, *Aviation personnel, Naval aviation.

A remedial mathematics (Remath) course was taught to students receiving deficient grades on the first weekly quiz in the mathematics course at the U. S. Naval School, Pre-flight. The Remath course was effective in raising the level of basic mathematical competence of those who passed the re-examination, but not of those who failed it. Remath instruction reduced by 2.1% the attrition rate for the period studied. At the same time, it raised both the mean grade in preflight courses, and the percentage of students passing them.

BIOLOGICAL SCIENCES

PB 158 032 $1.10

Colorado U., Boulder.
MAGNETIC SUSCEPTIBILITY OF SINGLE BIOLOGICAL CELLS, by S. J. Gill and M. Downing. Annual progress rept. 2 Dec 59-1 Dec 60, on Contract Nonr-1147(08). 29 Nov 60, 5p. 1 ref. AD-248 237.

DESCRIPTORS: *Cells (Biology), Magnetic susceptibility, Instrumentation, Design.

An instrument of the electromagnetic type has been completed and calibrated. The instrument is suitable for work in the ten micron diameter range. Redesign and construction of an instrument of the permanent magnet type has been completed. Experiments designed to measure the magnetic properties of red blood cells with the electromagnetic type instrument have been initiated. (Author) (See also PB 150 527)

TID-12766 $1.60

Johns Hopkins U. School of Medicine, Baltimore, Md.
PASSAGE OF WATER AND OTHER SUBSTANCES ACROSS BIOLOGICAL BARRIERS IN VIVO. METABOLIC ACTIVITIES OF ORGAN SYSTEMS IN VIVO. Supplementary progress rept. 15 Sep 58-15 June 61, on Contract AT(30-1)-1394. June 61, 11p.

Anatomy and Physiology

PB 158 657 $2.60

Bermuda Biological Station, St. George's West.
PHYSIOLOGY OF DEEP-SEA ANIMALS: DIURNAL LOCOMOTOR PATTERNS IN ANIMALS FROM 600 METERS, by Shepherd K. Roberts (Princeton U.). Annual rept. on Contract Nonr-1135(02). 1 Dec 60, 25p. 6 refs. AD-248 952.

DESCRIPTORS: *Marine biology, *Physiology, *Motor reactions, Aquatic animals, Bermuda, *Rhythm, Motion

The experiments undertaken here were focused on the question of whether or not biological clock mechanisms are operative in deep-sea animals. Clock-controlled daily rhythms have been previously demonstrated in a wide variety of terrestrial and littoral organisms where the adaptive significance of the timing mechanism is related to cycles in the physical environment. The present interest in the deep-sea forms was prompted by the possibility of obtaining animals from an environment where terrestrial variables are virtually absent. The results of this study conclusively show an operative clock mechanism in one of the forms dredged from 600 meters off Bermuda. The significance of this demonstration is discussed. (Author)

PB 154 380 $1.60

Visibility Lab., U. of California, San Diego.
A POSSIBLE CRITERION FOR VISUAL RECOGNITION THRESHOLDS, by James L. Harris. Rept. on Contract NObs-72092. Nov 59, 19p. SIO Reference 59-65; AD-231 633.

DESCRIPTORS: *Visual thresholds, Detection, Detectors, Statistical analysis, *Optical images.

The derivation of the recognition equations is accomplished for the ideal mosaic sensor. The following significant results are presented: (1) The ability to discriminate between 2 targets is determined by the quadratic content of the difference image. If 2 targets differ only by a protuberance on 1, the protuberance must be detected in order to perform discrimination. Also, it was shown that for the idealized monsaic sensor, the discrimination between 2 objects bears a definable relationship to the cross-correlation between the 2 objects. (2) The psychophysical experiment seems well explained by the difference image hypothesis. This takes into account the crude manner in which the detectability of the 10 different targets were compared (area consideration only.) The results were

encouraging, and further comparison of theoretical and experimental results is recommended. (3) On the basis of the evidence presented, it seems reasonable, when numerical recognition ranges are required, to assume that discrimination between 2 targets is equivalent to detection of the difference image. (Author)

Radiobiology

TID-13228 $1.25

Atomic Energy Commission. Div. of Biology and Medicine, Washington, D. C.
BIOLOGICAL, MEDICAL, AND ENVIRONMENTAL RESEARCH PROGRAM. Apr 61, 52p.

TID-14147 $8.10

Brigham Young U., Provo, Utah.
COMPARATIVE ECOLOGICAL STUDIES OF ANIMALS AT THE NEVADA TEST SITE. With specific reference to their reaction to exposure of nuclear effects. Annual progress rept. 1 Jan-31 Dec 60. 84p.

TID-13866 $1.60

Chicago U., Ill.
IRRADIATION EFFECTS ON THE CENTRAL NERVOUS SYSTEM, by Lloyd J. Roth. Progress rept. on Contract AT(11-1)-847. Oct 61, 13p.

TID-13509 $3.60

Connecticut U., Storrs.
RADIOACTIVE ZINC-65 IN MARINE ORGANISMS IN FISHERS ISLAND SOUND AND ITS ESTUARIES. Progress rept. on Contract AT(30-1)-2487. Aug 61, 33p.

Order from GPO $0.20 as
Y 3.F 31/17:8/2

Federal Radiation Council.
BACKGROUND MATERIAL FOR THE DEVELOPMENT OF RADIATION PROTECTION STANDARDS. Staff rept. Sep 61, 19p. Rept. no. 2.

DESCRIPTORS: Exposure, Population, *Radiological dosage, *Radiobiology, Radioactivity, Radiation effects, *Thyroid gland, *Bone, *Bone marrow, *Radioactive isotopes, *Strontium, Labeled substances, *Radium, *Iodine, Public health, Tissues (Biology), Metabolism, *Radiation injuries.

This report is concerned with the problem of providing guidance for Federal agencies in activities designed to limit exposure of members of population groups to radiation from radioactive materials deposited in the body as a result of their occurrence in the environment. Included are the following: (1) Radiation Protection Guides for certain organs of individuals in the general population, as well as averages over suitable samples of exposed groups, (2) guidance on general principles of control applicable to all radionuclides occurring in the environment, (3) some general principles by which Federal agencies may establish appropriate concentration values, and (4) specific guidance in connection with exposure of population groups to radium-226, iodine-131, strontium-90, and strontium-89.

TID-13867 $2.60

Kresge Eye Inst., Detroit, Mich.
THE EFFECT OF NEUTRONS AND OTHER RADIATIONS ON OCULAR LENS, by V. Everett Kinsey. Progress rept. Jan-Dec 61, 21p.

PB 159 206 $1.10

Naval Medical Research Inst., Bethesda, Md.
SHORT WAVE ELECTROMAGNETIC RADIATION AS A HAZARD TO PERSONNEL, by David E. Goldman. 17 Sep 60, 10p. 7 refs. Lecture and Review Series no. 60-6; AD-252 582.

DESCRIPTORS: *Electromagnetic waves, Man, *Radiation effects, Personnel, *Hazards, *Radiation hazards, *Radiation injuries, Eye, Pathology, Body temperature, Skin, Tests, Shielding, Countermeasures

Some of the problems encountered in dealing with the effects of intensive, short wave electromagnetic radiation on human beings are briefly outlined. An analysis is made of what happens when electromagnetic short wave radiation impinges on an animal. Body heating and its effects are discussed, and special problems relating to individual parts of the body are presented. The role of nonthermal effects of short wave radiation is briefly explored. A few suggestions are made to counteract the effects of electromagnetic radiation.

TID-13097 $4.60

New England Deaconess Hospital and Harvard Medical School, Boston, Mass.
THE EFFECTS OF IONIZING RADIATIONS ON THE DEVELOPING ANIMAL WITH SPECIAL REFERENCE TO THE NERVOUS SYSTEM, by Samuel P. Hicks. Rept. on Contract AT(30-1)-1454. July 61, 44p.

COO-224 $9.10

Utah U. Coll. of Medicine, Salt Lake City.
RESEARCH IN RADIOBIOLOGY. CHRONIC TOXICITY PROGRAM. Semi-annual progress rept. on Contract AT(11-1)-119. Sep 61, 104p.

TID-13098 $5.60

Yale U., New Haven, Conn.
INVESTIGATIONS ON THE CYTOGENETIC EFFECTS OF RADIATION. Progress rept. 1 June 60-31 May 61, on Contract AT(30-1)-872. July 61, 50p.

CHEMISTRY

IS-342 $3.50

Ames Lab., Iowa State U. [of Science and Tech.]
ENERGY LEVELS OF PLATINUM (II) COMPLEXES ON THE BASIS OF LIGAND FIELD THEORY, by Richard Ferdinand Fenske and Don S. Martin. Rept. on Contract W-7405-eng-82. May 61, 248p.

NAA-SR-5049 $0.50

Atomics International, Canoga Park, Calif.
RADIOISOTOPIC INVESTIGATION OF OMR COOLANTS, PART I. OMRE OPERATION, by L. Baurmash, S. J. Wode, and D. C. Lawrence. Rept. Jan 58-Aug 60, on Contract AT(11-1)-GEN-8. Dec 61, 23p.

LA-2626 $0.50

Los Alamos Scientific Lab., N. Mex.
THE KINETICS OF A SYSTEM OF CONSECUTIVE FIRST AND SECOND ORDER REACTIONS IN THE NONSTEADY STATE REGION, by T. W. Newton and F. B. Baker. Rept. on Contract W-7405-eng-36. Dec 61, 15p.

TID-14090 $5.60

Michigan State U., East Lansing.
AN INVESTIGATION OF SOME RARE EARTH BORON, CARBON, NITROGEN AND RELATED SYSTEMS AT ELEVATED TEMPERATURES, by Harry A. Eick, Gordon L. Galloway and others. Technical progress rept. 1 Feb 61-30 Jan 62, on Contract AT(11-1)-716. Nov 61, 54p.

ORNL-TM-1 $8.60

Oak Ridge National Lab., Tenn.
CHEMICAL DEVELOPMENT SECTION B. Quarterly progress rept. Apr-June 61. Nov 61, 91p.

NYO-2530 $2.25

Radiation Applications, Inc., Long Island City, N. Y.
THE ACCELERATING EFFECT OF ADDITIVES ON RADIATION-INDUCED GRAFT POLYMERIZATION, by George Odian, Marjorie Sobel and others. Rept. on Contract AT(30-1)-2318. Feb 61, 79p.

Analytical Chemistry

IS-376 $1.50

Ames Lab., Iowa State U. [of Science and Tech.]
ACTIVATION ANALYSIS FOR RARE-EARTH IMPURITIES IN YTTRIUM, by Kai Mow Wong and A. F. Voigt. Rept. on Contract W-7405-eng-82. Aug 61, 57p.

RMO-3001(Rev. 1) $2.00

Lucius Pitkin, Inc., Grand Junction, Colo.
HANDBOOK OF ANALYTICAL PROCEDURES, comp. and ed. by R. W. Langridge, W. E. Bush and others. Rept. on Contract AT(05-1)-776. June 61, 92p.

DP-648 $0.50

Savannah River Lab., Aiken, S. C.
SPECTROCHEMICAL METHODS FOR ANALYSIS OF PROCESS SOLUTIONS, by Douglas H. Purcell and J. Allen Wheat. Rept. on Contract AT(07-2)-1. Oct 61, 10p.

Y-1369 $0.50

Union Carbide Nuclear Co., Oak Ridge, Tenn.
DETERMINATION OF THORIUM IN THORIUM METAL, by L. M. Steckel. Rept. on Contract W-7405-eng-26. Aug 61, 14p.

Physical Chemistry

IS-339 $1.00

Ames Lab., Iowa State U. [of Science and Tech.]
REDUCTION OF NIOBIUM PENTOXIDE BY CARBON, by Ernest R. Stevens and H. A. Wilhelm. Feb 61, 44p.

NAA-SR-6460 $0.50

Atomics International, Canoga Park, Calif.
E.M.F. MEASUREMENTS IN MOLTEN BISMUTH-BISMUTH TRICHLORIDE SOLUTIONS, by L. E. Topol, S. J. Yosim, and R. A. Osteryoung. Rept. on Contract AT(11-1)-GEN-8. Dec 61, 23p.

ORO-492 $0.50

Isotope Development Lab., Research Triangle Inst., Durham, N.C.
INVESTIGATION OF A TRITIUM ENRICHMENT TECHNIQUE, by Harold G. Richter. Rept. on Contract AT(40-1)-2513. May 61, 22p. RTI-2513-T2-1.

UCRL-9903 $0.50

Lawrence Radiation Lab., U. of California, Berkeley.
ON pH EFFECTS IN THE RADIOLYSIS OF AQUO-ORGANIC SYSTEMS, by Warren M. Garrison, Boyd M. Weeks, and Sibyl Cole. Rept. on Contract W-7405-eng-48. Oct 61, 5p.

MATT-99 $1.50

Princeton U., N. J.
ELECTRICAL CONDUCTIVITY OF FUSED SALTS, by E. F. Johnson and F. W. Pardee, III. Rept. on Contract AT(30-1)-1238. Aug 61, 61p.

EARTH SCIENCES

PB 151 399-6 $1.50

Central Radio Propagation Lab., National Bureau of Standards, Boulder, Colo.
MEAN ELECTRON DENSITY VARIATIONS ON THE QUIET IONOSPHERE NO. 6. AUGUST 1961, by J. W. Wright, L. R. Wescott and D. J. Brown. Sep 61, 57p. 5 refs. Technical note no. 40-6.

DESCRIPTORS: *Ionosphere, Analysis, *Electrons, Density, Determination, Atmospheric sounding

See also PB 151 399-5

Order from GPO $0.45 as
C 4.19/2:62-1/2

Coast and Geodetic Survey, Washington, D. C.
TELLUROMETER MANUAL, by Austin C. Poling. Revised ed. 1961, 76p. Publication 62-1.

DESCRIPTORS: *Geodesics, Measurement, Instrumentation, *Tellurometers, Instruction manuals.

Contents:
The Tellurometer distance-measuring system
Computations
Field troubleshooting
Instructions for Tellurometer traverse
Theory of operation, by T. J. Hickley

Order from GPO $0.70 as
C 30.66/2:5.31

Weather Bureau, Washington, D. C.
CATALOGUE OF METEOROLOGICAL SATELLITE DATA – TIROS I TELEVISION CLOUD PHOTOGRAPHY. 1961, 147p. Key to Meteorological Records Documentation no. 5.31.

DESCRIPTORS: *Clouds, Photographic analysis, Aerial photographs, *Meteorological data, *Satellite vehicles, Maps, Documentation, Television cameras, Photographic recording systems, Climatic factors

This bulletin contains a complete listing of cloud photographs obtained by the TIROS I meteorological satellite, and a set of maps showing their geographical coverage. It also describes how copies of these photographs may be obtained.

Frost Science

PB 159 279 $1.60

Army [Cold Regions Research and Engineering Lab.] Wilmette, Ill.
ADHESIVE PROPERTIES OF ICE, PART II, by H. H. G. Jellinek. Rept. on Thickness and Strength of Ice Surface Layers. July 60, 15p. 11 refs. Research rept. 62.

DESCRIPTORS: *Ice, Adhesion, Stainless steel, Quartz, Surfaces, Thickness, Mechanical properties

The results of shear tests on the system ice/stainless steel and ice/optically flat fused quartz as a function of the rate of shear and roughness of the steel surface are reported. The adhesive strength decreased with decreasing roughness of steel surfaces, and the force-vs-time curves for smooth steel plates resembled those of 2 solids sliding over each other with a liquid layer between. This behavior was especially evident in the case of quartz. The adhesive strength as a function of rate of shear was linear for both ice/stainless steel and ice/quartz, but there were indications of yield values. The results agree with the assumption of a liquid-like layer on ice. Ratios of viscosity coefficient to layer thickness were evaluated for both systems, and viscosity coefficients are estimated. The importance of interfacial free-energy considerations is pointed out. (Author)

PB 159 281 $15.50

Army [Cold Regions Research and Engineering Lab.] Wilmette, Ill.
BIBLIOGRAPHY ON SNOW, ICE AND PERMAFROST WITH ABSTRACTS, by Thomas E. Hughes. Jan 59, 239p. 999 refs. SIPRE rept. 12, Volume 13; AD-217 715.

DESCRIPTORS: *Snow, *Ice, *Permafrost, *Bibliography

PB 159 278 $1.60

Army [Cold Regions Research and Engineering Lab.] Wilmette, Ill.
BONDING OF FLAT ICE SURFACES. SOME PRELIMINARY RESULTS, by H. H. G. Jellinek. Rept. on Thickness and Strength of Ice Surface Layers. July 60, 15p. 9 refs. Research rept. 61.

DESCRIPTORS: *Ice, Adhesion, Stainless steel, Quartz, Surfaces, Cylindrical bodies, Bonding, Thickness, Mechanical properties

The results of experiments on the bonding of polished and microtomed surfaces of bubble-free ice samples at -5C with various loads are reported. Only a small part of the available surface area appeared to be bonded, this area increasing with the bonding load. Surfaces apposed immediately after preparation showed an appreciably higher force of separation than those joined after a time interval. The force of separation for surfaces placed together at 0% relative humidity was higher than that at 100% relative humidity. A simplified theory of bonding of irregular ice surfaces is formulated in the appendix. The calculations are based on the assumption of a distribution of small ice cylinders of equal cross sections but different heights located on a non-deformable plate. The cylinders are deformed by a constant force which is applied by another completely non-deformable flat plate. The deformation as a function of force and time and the force of separation as a function of load are derived, assuming that the distribution of heights is given by a box distribution (i.e., frequency of heights is constant). (Author)

PB 159 276 $1.60

Army [Cold Regions Research and Engineering Lab.] Wilmette, Ill.
GROWING OF LARGE SINGLE CRYSTALS OF ICE, by J. K. Landauer. Final rept. July 58, 12p. 10 refs. Research rept. 48; AD-209 356.

DESCRIPTORS: *Ice, *Crystal structure, Production, Growth, Single crystals, Water, Fracture (Mechanics), Thermal expansion, Encapsulation, Microstructure

Crystals as large as 15 cm in diam and 25 cm high were grown on seed cyrstals 1 cm or more thick in contact with water usually at 4C. The artificial and natural monocrystalline seeds were mounted on a copper plate brine-cooled to -10C or -15C, with a 1- to 2-cm buffer layer of ice between to prevent fracture of the seed by differences in thermal expansion. The growing face was suspended just below the surface of the water in a glass jar provided with a

basal needle valve, the whole assembly being enclosed in an insulated box. Most of the crystals grown were optically single with occasional intergrowth having different orientation near the periphery. All crystals displayed wavy isogyres and undulating extinction under polarized light, and those grown from artificial seeds often showed pencil-shaped substructures differing in orientation by less than 2^{0}. Neither varied growth rates (1-10 cm/day) nor specially prepared water affected the crystals appreciably. Crystal quality was good except with artificial seeds having the c-axis parallel to growth. The possible causes for the imperfections are discussed. (Author)

PB 159 277 $8.10

Polytechnic Inst. of Brooklyn, N. Y.
PROPERTIES OF ICE, by Rudolf Brill and Paul R. Camp. Final rept. 1955-1956, on Investigations on Ice, Contract DA 21-018-ENG-16. May 61, 85p. 34 refs. CRREL Research rept. 68.

DESCRIPTORS: *Ice, Physical properties, Dielectric properties, Single crystals, Growth.

This report summarizes the results of a number of studies on ice performed by researchers at the Polytechnic Institute of Brooklyn during the period 1955-1959. Sections of the report are entitled as follows: growth of large single crystals of ice and ammonium-fluoride ice; lattice constants of mixed crystals of ice and ammoniumfluoride; degree of perfection of glacial ice crystals; thermal motion in ice and heavy ice; viscoelastic properties of ice; diffusion of NH_4F through ice; dielectric relaxation; effect of pressure) on dielectric properties; and investigation of the polarity of ice crystals. (Author)

PB 159 280 $7.60

[Research Inst., U. of Michigan, Ann Arbor].
ANALYSIS OF MICROMETEOROLOGICAL AND RELATED SNOW AND SOIL DATA FROM THE KEWEENAW FIELD STATION, by Donald J. Portman and Edward Ryznar. Rept. on Thermodynamic Studies of a Snow Cover in Northern Michigan, Contract DA 11-190-ENG-30. Jan 61, 79p. 33 refs. CRREL Research rept. 74.

DESCRIPTORS: *Snow, *Soils, Michigan, Thermodynamics, Heat transfer, *Micrometeorology, Meteorology.

The heat transfer processes between a snow cover and its environment were studied and evaluated in order to predict changes in the physical characteristics of the snow cover from standard meteorological information. The study was based on micrometeorological and related snow and soil data collected at the Keweenaw Field Station (Mich.) from 1954-1956. Computations of conductive heat transfer in snow, using the Liljequist method, showed significant correlation with average air temperatures. Average values of the cold content of snow can be estimated from average air temperatures. Average temperature differences through the snow can be estimated from a knowledge of the previous 20-hr average air temperature; snow hardness can be estimated graphically from snow density and depth. (Author)

Order from GPO $0.10 as S 1.38:108

Department of State, Washington, D. C.
GEOGRAPHIC REGIONS OF ASIA: SOUTH AND EAST, by G. Etzel Pearcy. Sep 61, 10p. Department of State publication 7262, publication 6954, rev.; Far Eastern Series 108.

DESCRIPTORS: *Geography, *Asia.

Reprint from the Department of State Bulletin, p. 1-10, 1 Feb 60.

This is the third in a series of articles on the nomenclature of geographic regions.

PB 158 666 $2.60

Indiana U., Bloomington.
COMMERCIAL GEOGRAPHY OF DOMINICA, by Arlin D. Fenetem. Technical rept. no. 5 on Contract Nonr-908(13). Dec 60, 22p. 20 refs. AD-251 895.

DESCRIPTORS: *Commerce, *Caribbean Islands, *Economic conditions, *Windward Islands, Geography, Agriculture, Shipping.

Dominica, a British Island in the middle of the Antillean arc, is discussed in connection with its geography, historical background, and how they have effected its production, exports and imports. An economically poor island, Dominica is now exploring ways of exploiting its resources. Its economic progress is discussed, and possible solutions to its problems are presented. (Author)

PB 157 402 $2.60

Indiana U., Bloomington.
COMMERCIAL GEOGRAPHY OF GRENADA, by Robert C. Kingsbury. Technical rept. no. 3 on Contract Nonr-908(13). Oct 60, 27p. 29 refs. AD-250 444.

DESCRIPTORS: Caribbean Islands, *Commerce, *Geography, Economics.

Contents:
The physical setting
The human element
The historical background
Production
Internal transport and port facilities
The export trade
Invisible exports
Imports and commercial enterprises
Outlook for future

PB 158 665 $2.60

Indiana U., Bloomington.
COMMERCIAL GEOGRAPHY OF MONTSERRAT, by Otis P. Starkey. Technical rept. no. 6 on Contract Nonr-908(13). Dec 60, 23p. 28 refs. AD-251 900.

DESCRIPTORS: *Caribbean Islands, Commerce, *Geography, *Economic conditions, Terrain, *Economics, Sociology, Agriculture, Production, Transportation, Shipping.

PB 158 027 $4.60

Indiana U., Bloomington.
COMMERCIAL GEOGRAPHY OF TRINIDAD AND OF TOBAGO, by Robert C. Kingsbury. Technical rept. no. 4 on Contract Nonr-908(13). Nov 60, 44p. 60 refs. AD-250 445.

DESCRIPTORS: Caribbean Islands, Trinidad, *Commerce, *Geography, Economics.

Contents:
List of tables
Summary of findings
The physical setting
The historical background
Population composition
Local productive activities
Petroleum industry
Agriculture
Fishing and forestry
Manufacture
Internal transport and port facilities
Exports and the transshipment trade
Invisible exports
Imports and commercial enterprises
Tobago
Outlook for future

Geology

UCRL-13020 $1.25

Colorado School of Mines Research Foundation, Inc., Golden.
SOURCES OF INFORMATION ON ROCK PHYSICS, by Lorraine Burgin. Current literature, August 1961. 51p.

TEI-784 $0.50

Geological Survey, Washington, D. C.
GEOLOGIC ASPECTS OF THE NOVEMBER 1960 HIGH-EXPLOSIVE TEST AT THE PROJECT CHARIOT SITE, NORTHWESTERN ALASKA, by Reuben Kachadoorian. May 61, 18p.

Order from GPO $0.40 as
I 19.16:356-C

Geological Survey, Washington, D. C.
GEOLOGY AND GEOCHEMISTRY OF URANIUM IN MARINE BLACK SHALES, A REVIEW. URANIUM IN CARBONACEOUS ROCKS, by Vernon E. Swanson. 1961, 46p. Geological Survey Professional paper 356-C.

DESCRIPTORS: *Uranium, Sources, Geology, Geochemistry, *Shales, Rock.

More than 200 formations in the United States containing marine black shale units, ranging from Precambrian to Tertiary in age, were examined during the period 1944-1957 for black shale that might be exploited as a source of uranium. Black shale beds were checked for their radioactivity at thousands of outcrops, in thousands of feet of well core, in thousands of samples of drill cuttings, and on many hundreds of gamma-ray logs, and an estimated 8,000 samples were chemically analyzed for uranium. Of all the shale beds tested, none was found that could be mined and processed economically for uranium. The Chattanooga shale of the southeastern United States and the phosphatic black shales of Pennsylvanian age in Kansas and Oklahoma were found to be the most extensive uraniferous shales in the United States. Their uranium content is relatively high, generally between 0.005 and 0.010 percent.

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Geological Survey, Washington, D. C.
GEOLOGY OF THE CROSS PLAINS QUADRANGLE, BROWN, CALLAHAN, COLEMAN, AND EASTLAND COUNTIES TEXAS. PENNSYLVANIAN AND LOWER PERMIAN STRATIGRAPHY, BETWEEN THE BRAZOS AND COLORADO RIVERS, NORTH-CENTRAL TEXAS, by Philip T. Stafford. 1961, 34p. Geological Survey bulletin 1096-B.

DESCRIPTORS: *Geology, Geological survey, *Texas.

The Cross Plains quadrangle lies in north-central Texas in parts of Brown, Callahan, Coleman, and Eastland Counties and covers an area of about 254 square miles. Studies were made of the lithologic characteristics, distribution, stratigraphic relations, thickness, and age of the rocks in the quadrangle. Rocks assigned to the Cisco group of the Pennsylvanian system and to the Wichita group of the Permian system underlie about one-third of the quadrangle, and the rocks assigned to the Trinity and Fredericksburg groups of the Cretaceous system underlie the remainder of the area. Quaternary alluvium and small amounts of terrace gravel of Pleistocene (?) and Recent age are present along the major streams. About 75 percent of the Pennsylvanian and Permian rocks is gray and red shale; the rest is limestone, sandstone, siltstone, and conglomerate. The Trinity group of the Lower Cretaceous (Comanche) series consists of about 90 percent sandstone and 10 percent conglomerate, siltstone, and shale. The Fredericksburg group, overlying the Trinity, consists of limestone and small amounts of interbedded shale. About 3,100 wells had been drilled for petroleum in the quadrangle and several tens of millions of barrels of oil had been produced up to January 1, 1955.

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I 19.3:1111-F

Geological Survey, Washington, D. C.
GEOLOGY OF THE BONNER QUADRANGLE MONTANA. CONTRIBUTIONS TO GENERAL GEOLOGY, by Willis H. Nelson and Joseph P. Dobell. 1961, 47p. Geological Survey bulletin 1111-F.

DESCRIPTORS: *Geology, Geological survey, *Montana.

The geology of the Bonner quadrangle in western Montana was mapped principally to study the Missoula group of the Belt series, and the structure of the area. The type localities of the formations comprising this group are all in or near the Bonner quadrangle. These formations are here redefined and in part renamed. Like the rest of the Belt series, the Missoula group has been regarded heretofore as of late Precambrian age but in our opinion the results of the present study suggest that its upper part may be of Cambrian age.

Order from GPO $0.15 as
I 19.13:1545-A

Geological Survey, Washington, D. C.
MICROTIME MEASUREMENTS IN AQUIFER TEST ON OPEN-HOLE ARTESIAN WELLS. METHODS OF AQUIFER TESTS, by Granville G. Wyrick and Edwin O. Floyd. 1961, 11p. Geological Survey Water-Supply paper 1545-A.

DESCRIPTORS: *Water supplies, Test methods, Photographic recording systems, Geology.

Water-level and time measurements made during the early seconds or minutes of drawdown or recovery tests on a pumped or flowing well may be used to determine the transmissibility of an artesian aquifer. This report describes a photographic method, using a motion picture camera, stopwatch, and manometer tube, of recording water-level measurements and microtime measurements (time measurements at intervals of about 1/25 second) in a well penetrating a leaky artesian aquifer. The results of the test are compared with the results obtained from conventional measurements at a control well. Further tests are necessary to determine the utility of this method under different field conditions. (Author)

TEM-567 $0.50

Geological Survey, Washington, D. C.
RADIOACTIVE MANGANESE OCCURRENCES IN THE LOWER RIO ITAPICURU VALLEY, BAHIA, BRAZIL, by Donald D. Haynes, Henry Mau and Max G. White. Apr 58, 11p.

TEM-1098 $0.50

Geological Survey, Washington, D. C.
RECONNAISSANCE FOR RADIOACTIVE MINERALS IN THE SOUTHERN PART OF BRAZIL, by Charles T. Pierson, Donald D. Haynes, and Evaristo Ribeiro, Filho. Jan 57, 19p.

Order from GPO $2.50 as
I 19.16:424-B

Geological Survey, Washington, D. C.
SHORT PAPERS IN THE GEOLOGIC AND HYDROLOGIC SCIENCES, ARTICLES 1-146, GEOLOGICAL SURVEY RESEARCH 1961. 1961, 344p. Geological Survey Professional paper 424-B.

DESCRIPTORS: *Geology, *Hydrology, Scientific reports, Paleoecology, Geophysics, Minerals, Geochemistry, Petrology.

Contents:
Geology of metalliferous deposits
Hydrologic studies
Geology and hydrology of eastern United States
Geology and hydrology of western conterminous United States
Geology and hydrology of Alaska and Hawaii
Geology of Puerto Rico
Paleontology and plant ecology
Geophysics
Mineralogy, geochemistry, and petrology
Geology and hydrology applied to engineering and public health
Exploration and mapping techniques
Analytical and petrographic methods
Index

TEM-1097 $0.50

Geological Survey, Washington, D. C.
URANIFEROUS COAL AND CARBONACEOUS SHALE IN NORTHEAST PARANA, BRAZIL, by Donald D. Haynes and Charles T. Pierson. Jan 57, 20p.

Order from GPO $0.60 as
I 19.3:1107-C

Geological Survey, Washington, D. C.
THE URANIUM-VANADIUM ORE DEPOSIT AT THE MONUMENT NO. 1-MITTEN NO. 2 MINE, MONUMENT VALLEY NAVAJO COUNTY, ARIZONA. CONTRIBUTIONS TO THE GEOLOGY OF URANIUM, by Irving J. Witkind. 1961, 24p. Geological Survey bulletin 1107-C.

DESCRIPTORS: *Uranium, *Vanadium, Ores, Deposits, *Minerals, Geology, Mines, Arizona.

Near the mine, the strata range in age from Permian to Late Triassic. Erosion has removed most of the Shinarump from the Monument No. 1 area, and only several small remnants remain. Two of these, each about 2,000 feet long, are part of a once continuous channel fill; they aline to form a broad curve trending northwestward. The channel ranges in width from 50 to 280 feet, and has been scoured about 50 feet into the underlying strata. Three major lithologic units make up the basal channel fill: trash-pocket conglomerate, silica-cemented sandstone, and calcite-cemented sandstone. The uraniferous material was in approximate equilibrium. The ratio of vanadium to uranium for the mine was about 2.5:1. The ore is adjacent to calcite-cemented sandstone lenses; possibly the carbonate was instrumental in precipitating the ore minerals from the ore-bearing solutions.

TID-13001 $1.60

William Marsh Rice U., Houston, Tex.
GEOLOGIC ASPECTS OF THORIUM RECOVERY FROM COMMON ROCKS. Annual rept. 1 June 60-31 May 61, on Contract W-7405-eng-26. June 61, 19p.

Mineralogy

Order from GPO $1.50 as
I 19.3:1139

Geological Survey, Washington, D. C.
INDEX OF METALLIC AND NONMETALLIC MINERAL DEPOSITS OF ALASKA, COMPILED FROM PUBLISHED REPORTS OF FEDERAL AND STATE AGENCIES THROUGH 1959, by Edward H. Cobb and Reuben Kachadoorian. 1961, 363p. Geological Survey bulletin 1139.

DESCRIPTORS: *Minerals, Deposits, Alaska, Indexes

A card index of data on the occurrences of valuable or potentially valuable minerals was compiled and placed in 11 depositories for consultation by the public. To increase the availability of these data, this index has been prepared for publication. This index contains page references to data on mines, prospects, and reported occurrences of valuable or potentially valuable minerals in Alaska, exclusive of mineral fuels, fissionable materials, and bulk construction materials, such as sand and gravel.

SRO-57 $1.75

Georgia Inst. of Tecn. Engineering Experiment Station, Atlanta.
DELAMINATION OF KAOLIN BY HIGH-ENERGY, IONIZING RADIATION, by William J. Corbett and J. H. Burson, III. Final rept. 1 Apr 59-31 Mar 61, on Contract AT(3801)-202. Aug 61, 68p.

Oceanography

TID-14285 $2.60

Michigan State U., East Lansing.
AN ECOLOGICAL AND TAXONOMIC SURVEY OF AQUATIC BIOTA IN AN ANDEAN TRANSECT AT THE EQUATOR, by G. W. Prescott, Norman R. French, and Ronald Hodges. Sub-terminal progress rept. on Contract AT(11-1)-583. Nov 61, 21p.

TID-13783 $8.10

Wisconsin U., Madison.
RADIOISOTOPE EXCHANGE STUDIES IN LAKES. Progress rept. Jan-Dec 61, on Contract AT(11-1)-64. 84p.

ENGINEERING

ORNL-TM-63 $1.10

Oak Ridge National Lab., Tenn.
DEVELOPMENT OF CENTRIFUGAL COMPRESSORS, BY I. K. Namba. Oct 61, 10p.

Aeronautical Engineering

Order from GPO $0.40 as
NAS 1.12:90

National Aeronautics and Space Administration, Washington, D. C.
THEORY AND APPARATUS FOR MEASUREMENT OF EMISSIVITY FOR RADIATIVE COOLING OF HYPERSONIC AIRCRAFT WITH DATA FOR INCONEL, INCONEL X, STAINLESS STEEL 303, AND TITANIUM ALLOY RS-120, by William J. O'Sullivan, Jr. and William R. Wade. 1961, 24p. NASA Technical rept. R-90; supersedes NACA Technical note 4121 and NACA Technical note 4206.

DESCRIPTORS: *Hypervelocity vehicles, *Supersonic planes, *Aerodynamic heating, Thermal radiation, *Cooling, Blackbody radiation, Chromium, Iron, Nickel, Titanium, Alloys, Stainless steel, Temperature, Heat transfer, Measurement, Theory, *Heat resistant alloys
The importance of radiation as a means of cooling high supersonic and hypersonic speed aircraft is discussed to show the need for measurements of the total hemispherical emissivity of surfaces. The theory underlying the measurements of the total hemispherical emissivity of surfaces is presented, readily duplicable apparatus for performing the measurements is described, and measurements for stably oxidized Inconel, Inconel X, stainless steel 303, and titanium alloy RS-120 are given for the temperature range from 600° F to 2,000° F. (Author)

AD-266 269 repriced $2.75

National Aviation Facilities Experimental Center, Atlantic City, N. J.
EVALUATION OF PARALLEL RUNWAY SPACING, by J. A. Fantoni and R. D. Rudich. July 61, 149p. 11 refs. Task no. 412-3-2T.

DESCRIPTORS: *Runways, Design, *Instrument landings, *Ground controlled approach radar, Radar tracking, Airplane landings, Civil aviation, Flight testing.

A flight test program was conducted at Chicago-O'Hare International Airport and the National Aviation Facilities Experimental Center to investigate instrument landing system approaches under dual- and single-runway configurations. Aircraft flight paths were recorded and the effect of various equipment applications and control procedures observed. The results are analyzed to determine control procedures and equipment requirements for fail-safe operation of parallel runways. Various control procedures and equipment, as well as factors affecting aircraft overshoots and lateral deviations of instrument landing system approaches, are discussed. (Author)

AD-267 336 repriced $1.75

National Aviation Facilities Experimental Center, Atlantic City, N. J.
EVALUATION OF STR. 30-B1 RADIO ALTIMETER, by S. A. Segen. Final rept. Mar 61, 61p. 2 refs. Task no. 114-4-2T.

DESCRIPTORS: *Radio altimeters, Altimeters, Airborne, Physical properties, Operation, Tests, Flight testing

Laboratory and flight tests were conducted to determine altimeter performance. The laboratory tests included measurements of power consumption, transmitter power output, receiver sensitivity, system noise, sensitivity to line voltage variations and interferences, altimeter time constant, and static range errors. The flight tests included effects of aircraft noise, effects of moving the various aircraft appendages, determination of maximum usable altitude ranges, and in-flight accuracy. The accuracy tests included level flights at various altitudes and over various terrains, and performance during landing. Subjective data on pilot use of the equipment were obtained. Adequacy of test equipment and procedures and maintenance requirements were determined. (Author)

AD-266 273 repriced $1.25

National Aviation Facilities Experimental Center, Atlantic City, N. J.
A STUDY OF THE REQUIREMENTS FOR ARRIVAL RADAR HANDOFFS AND CONTINUOUS FLIGHT FOLLOWING OF AIRCRAFT, by N. A. Houska. Final rept. May 61, 47p. Task no. 101-51-2T.

DESCRIPTORS: *Air traffic control systems, *Air traffic controllers, *Airport radar systems, *Ground controlled approach radar, Aircraft, Monitors, Identification systems, Simulation, Tests, Radar tracking.

The objectives of this study were to determine if additional facility staffing is required for radar handoff of arrival aircraft, and to determine the feasibility of continuous radar flight following of aircraft, particularly in holding patterns. For comparison with sub- (Engineering--Aeronautical, 5 Mar 62, released sequent phases, a high-density terminal area was simulated, using present facility staffing to perform the handoff functions. Various modifications to this system, utilizing additional personnel for the radar handoff function, were subsequently simulated. Simulation tests indicated that radar handoffs and continuous radar monitoring of holding aircraft cannot be accomplished with present facility staffing. However, with some minor modifications, present operational facilities could implement handoff positions in both the center and approach control. Continuous flight following of individual aircraft in the holding patterns required intense concentration of the controllers, which could not be endured for extended periods of time. This limited the continuous flight following of aircraft in holding patterns to not more than two. With the addition of a radar-qualified controller at the handoff position, the safety and effectiveness of the system was increased.

AD-265 413 $12.00 Not announced by ASTIA

National Research Labs., Ottawa (Canada).
THEORY OF MULTI-SPAR AND MULTI-RIB WING STRUCTURES, by A. L. M. Grzedzielski. Jan 61, 168p. 38 refs. Aeronautical rept. LR-297; NRC no. 6187.

DESCRIPTORS: (*Wings, Stresses, Deformation, Mathematical analysis.) (Airframes, Elasticity, Plasticity, Thermal stresses, Differential equations, Integral equations, Partial differential equations, Matrix algebra, Box beams, Airplane panels.)

A method of stress and deflection analysis of low aspect ratio wings, proceeding entirely with redundant stress distributions, is presented. On the assumption of parallel ribs and converging spars, which determines the system of coordinates for the analytical work, all effects of lateral contraction, of wing sweep and taper, are correctly accounted for. A theory of a torque box of trapezoidal plan form is developed and a thorough criticism of the adopted lumping technique is given. The theory of thermal effects and of local plastic action is proposed. The method presumes the use of a digital computer of medium size and the results of computation appear in the form of matrices relating stress and displacement to a set of unit loads and temperatures. (Author)

AD-265 781 repriced $1.50

Naval Ordnance Test Station [China Lake, Calif.]
THE INFRARED RADIANT INTENSITY OF SEVERAL SMALL PROPELLER-DRIVEN AIRCRAFT, by L. W. Nichols. 12 Sep 60, 56p. IDP-973.

DESCRIPTORS: *Airplanes, *Infrared radiation, Thermal radiation, Measurement, Radiometers, Intensity, Civil aviation.

A series of 10 different propeller-driven aircraft were measured to determine their infrared radiant intensities for various aspects to ascertain if sufficient radiation was emitted by commonly-encountered aircraft to offer a means of developing an infrared collision-warning device. The aircraft models selected for measurement were chosen as representative types of small civilian and commercial airplanes. The measurements were made by means of a ground-based radiometer which recorded the infrared irradiance from various aircraft flying planned patterns above it.

PB 158 629 $4.60

Quartermaster Research and Engineering Command, Natick, Mass.
COLOR AND FABRIC REQUIREMENTS FOR PANEL SET, NUMBERED, AIR LANDING, by Frank J. Rizzo, Horace M. Robinson, Jr., and Alvin O. Ramsley. Dec 58, 46p. 34 refs. Textile Series rept. no. 104.

DESCRIPTORS: *Helicopters, *Landing aids, Color, Textiles, Military requirements, Runways, Visibility, Numbers, Visual signals, Signals, Detection

Military Characteristics proposed by CONARC for a numbered colored panel set for locating a landing zone and the specific point for depositing cargo have been studied from the standpoint of influence by atmospheric factors, specific conditions of illumination and viewing, influence of background, physiological and psychological factors of the observer, impact of the tactical situation, and specific textile problems, including fabric construction and capabilities of coloring systems. A panel set of the type specified in the MC's can be produced using colors which have been

selected to give maximum visibility and recognition. The specific colors chosen for this study were selected with purity of tone as the primary requisite and with colorfastness as a major requirement. The report demonstrates that the 3' x 4' panel size suggested in the MC's cannot be recognized at the 1-mile distance and 500-foot elevation, nor can the numerals be identified with assurance at the 300-yard distance as required by the MC's.

PB 181 097 $2.25

Surveys and Research Corp., Washington, D. C.
ANALYSIS OF AIRCRAFT RELIABILITY AND SAFETY ASSOCIATED WITH APPROACH AND LANDING OPERATIONS. Final rept. on Contract FAA/BRD 336. 30 June 61, 225p.

DESCRIPTORS: *Civil aviation, *Naval aviation, Military transportation, Air transportation, *Aviation accidents, *Aviation safety, Airplane landings, Landing aids, Approach indicators, Reliability

The purpose of this study is to provide a sound and definitive analysis of aircraft approach and landing accident data to determine the safety level in U. S. civil and military aircraft approach and landing operations. The study includes: an evaluation of British data and statistics utilized by the Air Registration Board to establish their safety and reliability indices for aircraft approach and landing; a determination as to types of data concerning United States civil and military flight safety records and statistical techniques that would produce indices that could be compared with Air Registration Board indices; and establishment, through analysis of appropriate United States military and civil flight safety data, of indices for measuring United States experience.

Chemical Engineering

ANL-6342 $2.25

Argonne National Lab., Ill.
A PROCESS FOR THE RECOVERY OF URANIUM FROM NUCLEAR FUEL ELEMENTS USING FLUID-BED DRYING AND VOLATILITY TECHNIQUES, by N. Levitz, J. Barghusen and others. Rept. on Contract W-31-109-eng-38. Nov 61, 105p.

PB 181 090 $2.75

Ferguson, H. K., Co., Inc., New York.
VAPOR COMPRESSION WITH SECONDARY HEAT-TRANSFER MEDIA. Rept. on Contract 14-01-001-209. Dec 61, 140p. 3 refs. Saline Water Research and Development progress rept. no. 56.

DESCRIPTORS: *Sea water, *Desalination, *Water vapor, Vapors, *Compresssors, *Evaporators, Vaporization, Vapor pressure, Costs, Fluids, Refrigerants, *Heat transfer, Methanes, Chlorides, Fluorides

The present concept of vapor compression must be modified to include a multiple-effect evaporator utilizing the available heat in the compressor driver exhaust. The vapor-compression cycle using a secondary fluid gives lower cost water than the cycle compressing water vapor. It appears that the compression unit using freon, or operated at a sufficiently low level, could produce, at no cost, about 2 tons per hour refrigeration for air conditioning per 1000 gallons per day of water at a water cost of 15% higher than when operated only to produce water. The freon compression unit can also be used effectively with peak-load electric generators that could produce low-pressure steam part of the cycle and have an excess of high-pressure steam available at other times.

HW-68630 $0.75

Hanford Atomic Products Operation, Richland, Wash.
CONTINUOUS SLAG AND CRUCIBLE DISSOLVER, by H. T. Blaine. Rept. on Contract AT(45-1)-1350. Feb 61, 25p.

MCW-1456 $0.50

Mallinckrodt Chemical Works, Weldon Spring, Mo.
THE EFFECT OF SULFATE ON THE EXTRACTION OF URANIUM BY DILUTED TRIBUTYL PHOSPHATE, by G. P. Lang and M. O. Nethaway. Rept. on Contract W-14-108-eng-8. Dec 61, 16p.

NLCO-690(Del.) $9.60

National Lead Co. of Ohio, Cincinnati.
SUMMARY TECHNICAL REPORT FOR THE PERIOD 1 JULY-30 SEPTEMBER 57, ed. by John W. Simmons. Rept. on Contract AT(30-1)-1156. Declassified with deletions 3 Feb 60. 108p.

IDO-14565 $0.50

Phillips Petroleum Co., Idaho Falls
THE DISSOLUTION OF IRON AND NICKEL IN DILUTE AQUA REGIA, by R. D. Cannon. Rept. on Contract AT(10-1)-205. Nov 61, 22p.

IDO-14563 $0.50

Phillips Petroleum Co., Idaho Falls.
SERIES ELECTROLYTIC DISSOLVER FOR NUCLEAR FUELS. I. SCOPING STUDIES, by M. R. Bomar. Rept. on Contract AT(10-1)-205. Nov 61, 23p.

DP-624 $0.75

Savannah River Lab., Aiken, S. C.
ANION EXCHANGE IN A LARGE-SCALE AGITATED BED, by Vincent P. Caracciolo. Rept. on Contract AT(07-2)-1. Sep 61, 28p.

Y-1372 $1.50

Union Carbide Nuclear Co., Oak Ridge, Tenn.
AN INVESTIGATION OF THE SOLID PARTICULATE COLLECTION EFFICIENCY OF THE TRAVERSE-TYPE STACK PROBE, by R. B. Schappel. Rept. on Contract W-7405-eng-26. Oct 61, 59p.

Civil Engineering

Order from GPO $3.00 as
D 103.15:4/961

Beach Erosion Board, Corps of Engineers, Washington, D. C.
SHORE PROTECTION PLANNING AND DESIGN, 1961, reprinted with revisions of Feb 57 and May 61, 578p. Technical rept. no. 4, superseded special issue no. 2.

DESCRIPTORS: *Beaches, Erosion, Countermeasures *Breakwaters, Design, Geophysics, Wind, Water waves

This report has been prepared with a view to assembling in a single volume a manual of practice for shore protection. The term "shore protection", as it is used herein, applies primarily to works designed to stabilize seacoasts and shores of large bodies of water where wave action is the principal cause of erosion. An attempt has been made to include herein a detailed summary of applicable methods, techniques and useful data pertinent to the solution of shore protection problems. Part I discusses the factors considered important in the analysis of such problems; part II presents generally accepted practice in structural design techniques for shore structures. Graphs and tables to facilitate computations and analysis are provided throughout the text and in appendices.

Order from GPO $0.75 as
D 103.6/3:1110-345-147

Engineer Corps, Washington, D. C.
PROCEDURES FOR FOUNDATION DESIGN OF BUILDINGS AND OTHER STRUCTURES (EXCEPT HYDRAULIC STRUCTURES). Engineering and Design Manual. 15 Aug 61, 134p. EM 1110-345-147.

DESCRIPTORS: *Civil engineering, *Instruction manuals, Buildings, Structures, *Foundations (Structures), Design, Soils, Rock, Test methods, Mechanical properties

This manual presents instructions relative to the selection and design of foundations for buildings and other structures to be constructed on rock and on natural or man-made deposits of soils under varying climatic conditions, including areas of deep frost penetration. Because of the comprehensive nature of the subject, the manual is confined principally to describing the methods and procedures recommended for practical usage, with supporting theoretical and descriptive material handled largely by reference. The information presented is considered sufficiently general that it can be adapted to a wide variety of construction. However, emphasis has been placed on types of construction usually encountered on military reservations.

Order from GPO $0.15 as
D 103.6/3:1110-345-304

Engineer Corps, Washington, D. C.
SOIL STABILIZATION FOR ROADS AND STREETS, Engineering and Design Manual. 31 July 61, 14p. EM 1110-345-304.

DESCRIPTORS: *Civil engineering, *Instruction manuals, *Roads, Construction, *Soils, Stabilization, Materials, Cement, Calcium compounds, Oxides, Bitumens, *Foundations (Structures), Mechanical properties

This manual presents methods of stabilizing soils for use as base courses, subbases, and subgrades for roads and streets.

PB 159 208 $1.60

Naval Radiological Defense Lab., San Francisco, Calif.
THE USNRDL EXPERIMENTAL SHELTER (A NON-TECHNICAL SUMMARY), by W. E. Strope. 22 Feb 60, 19p. Reviews and Lectures no. 98.

DESCRIPTORS: *Protective shelters, Design, Experimental data.

The USNRDL experimental shelter is a buried flexible-steel-arch structure, 25 feet wide by 48 feet long, similar to that used by the Navy as an ammunition storage magazine, that is furnished and equipped to maintain the life and basic health of 100 people for a period of approximately 14 days. It is designed to provide protection against air blast, mass fires, initial radiation and radioactive fallout from nuclear attack. It is provided with facilities for sleeping, eating, sanitation, and recreation, and with stored supplies of food, drinking water, and materials for personal and shelter cleanliness. To maintain a habitable environment, a mechanical ventilation system, together with an auxiliary power unit for use in event of normal power failure, is provided. Radiocommunications equipment is installed as well as equipment needed to determine the radiological and damage conditions outside the shelter without the necessity of leaving the safety of the shelter. An operating guide has been prepared that provides all necessary information for the operation of shelter equipment and for the organization of shelters so as to minimize the discomforts of shelter living.

Electrical and Electronic Engineering

PB 158 640 $8.10

Colorado U. Engineering Experiment Station, Boulder.
A STUDY OF SELF-ACTUATED TRANSIENTS IN HIGH-PERVEANCE PLANAR ELECTRON TUBES, by J. C. Twombly and J. E. Lauer. Technical rept. no. 2 on Contract Nonr-1147(06). 1 Dec 60, 81p. 6 refs.

DESCRIPTORS: *Diodes, Transients, *Space charges, Electron tubes, Electron tubes, Electrodes, Plasma physics, Electron beams, Stability, Mathematical analysis, Potential theory.

An analytical study is made of certain behavior occurring in a short-circuited infinite planar diode when the velocity of convection current injected through one plane is adjusted to give, in turn, each of the two critical values of perveance possible. It is found that the higher critical perveance value leads to instability in

the form of an oscillation whose frequency is two times the plasma frequency calculated on the basis of charge density at the entrance plane. That this is not just "ringing" resulting from an initial transient impulse in a lossless system is demonstrated by reinitiating the problem routine with initial conditions corresponding to the alternate (and in past conjectures, stable) static solution. So long as perveance is unchanged, steady-state oscillation at this same frequency develops regardless of initial conditions of charge displacement and velocity within the space. An extension of this problem is presented, in which the effects of electrons returned to the gun region are acknowledged. Quantitative results are highly dependent upon the capture cross-section of the grid. (Author)

PB 156 665 $7.60

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
INVESTIGATION OF NOISE GENERATED IN ELECTRICALLY TUNABLE MICROWAVE OSCILLATORS, by G. C. Dalman and P. R. McIsaac. Quarterly progress rept. no. 1, 15 Sep-15 Dec 60, on Contract DA 36-039-sc-87368, continuation of Contract DA 36-039-sc-84524. [1960] 80p. 26 refs. Research rept. EE 488; AD-254 766.

DESCRIPTORS: *Microwave oscillators, Oscillators, Electronic equipment, Microwave equipment, Signal-to-noise ratio, *Backward-wave oscillators, *Backward-wave amplifiers, Traveling wave tubes, Electron tubes, Theory, Mathematical analysis, Polarization, X band, Noise analyzers, *Noise (Radar), Reduction, Transducers, *Doppler radar, Noise (Radio), Noise generators
Research is directed toward an understanding of the mechanism of the noise and spurious-output-signal generation of electrically tunable oscillators and to determine possible methods of improving the performance of these devices as local oscillators. The equations that describe small-signal gain and signal-to-noise ratio in a backward-wave amplifier were rederived to allow a finite value of the travelling-wave tube C factor. Expressions for velocity, force, charge density, and current density of the beam were formulated in terms of polarization in several coordinate systems. A theoretical study was made of the modulating and output noise of the general, self-excited oscillator. An apparatus to measure noise in X-band oscillators appearing as frequency modulation at frequencies less than 50 kc was assembled. The use of an active transducer to reduce the slow-wave noise power in a traveling-wave tube was investigated theoretically. (Author)

PB 156 234 $6.60

Electronic Systems Lab., Mass. Inst. of Tech., Cambridge.
AN APPROACH TO SIMPLIFICATION OF BOOLEAN FUNCTIONS, by Karl S. Menger. Master's thesis. Rept. on Contract AF 33(616)5477. June 60, 65p. 5 refs. Rept. 7849-R-11; AD-242 252.

DESCRIPTORS: *Switching circuits, Synthesis, Mathematical analysis, *Mathematical logic, *Special functions, Functions

In the language of symbolic logic, the problem is that of obtaining the minimum disjunction of conjuncts for any Boolean function given in normal form. In the language of logical design, the problem is that of obtaining the minimum two-level switching circuit. A new approach is given which obtains the minimum-covers more directly than the Quine-McCluskey procedure. Extremal prime implicants are identified at the outset and certain types of necessary prime implicants are identified subsequently. The new approach includes a method for obtaining all prime implicants for that part of the function which remains uncovered after identification steps have been applied. This latter method is applicable to all switching functions; but it obtains the exhaustive list of prime implicants for the uncovered portion, both used and unused, except for those covering don't-care conditions exclusively. For functions which contain only one prime implicant in their minimum-covers, equations describing the required computer storage space and labor are developed for both the Quine-McCluskey procedure and the new approach. (Author)

PB 156 229 $11.00

[Electronic Systems] Lab., Mass. Inst. of Tech., Cambridge.
CONSTRAINTS AND PERFORMANCE INDICES IN THE ANALYTICAL DESIGN OF LINEAR CONTROLS, by James F. Kaiser. Master's thesis. Rept. on Contracts AF 33(616)5477 and DA 19-020-ORD-4637. Feb 59, 147p. 34 refs. Repts. 7849-R-6 and 7967-R-1; AROD proj. 2001.

DESCRIPTORS: *Control systems, Electric servomechanisms, Design, Specifications, Synthesis, Numerical analysis, Errors, Integral equations, Electric filters, Integral transforms, *Linear systems Low pass filters.

The analytical methods of control system design embody a procedure which starts with specifications on the system input, desired output, and the fixed elements of the system, and on the basis of a selected criterion of performance, yield the system which best meets the specifications if such a system exists. The utility of these methods are limited somewhat by the restrictions which must be made in the specifications in order to obtain analytically an answer to the problem. This report is concerned with methods by which additional practical specifications can be included in the problem formulation and solution which render the solution much more useful.

PB 156 232 $10.50

Electronic Systems Lab., Mass. Inst. of Tech., Cambridge.
EFFECTS OF QUANTIZATION ON FEEDBACK SYSTEMS WITH STOCHASTIC INPUTS, by Robert Kramer. Doctoral thesis. Rept. on Contracts AF 33(616)5744 and DA 19-020-ORD-4637. July 59, 139p. 12 refs. Rept. 7849-R-9 and 7967-R-2; AROD proj. 2001; AD-227 216.

DESCRIPTORS: *Control systems, Statistical processes, Errors, Integral equations, *Digital computers, Servomechanisms, *Mathematical computer data, Electronic equipment

A study is presented of a simple feedback system with a quantizer in the error channel and with a random input. The autocorrelation of the error is determined in terms of the input autocorrelation, the system dynamics, and the quantizer box size. The influence of the nonlinear element enters through 2 relations: (1) the quantizer output autocorrelation as a function of the quantizer input autocorrelation, and (2) the relation between cross-correlations involving the system input and the quantizer input and output. These relations depend on joint distributions which are not known and which involve the error. Assuming that these distributions are of Gaussian form, the necessary cross- and auto-correlation relations are determined. Using these relations with pertinent linear relations for the system, a nonlinear integral equation is obtained. The solution of this equation for the error autocorrelation is obtained by a successive approximation technique. The procedure does not work when the system contains an integration. An experimental program, carried out on a digital computer, demonstrated that the approximations to the basic correlation relations were good for quantizer box sizes equal to, or less than, twice the error standard deviation.

PB 156 235 $15.50

Electronic Systems Lab., Mass. Inst. of Tech., Cambridge.
INVESTIGATION OF A THIN-FILM THERMAL TRANSDUCER, by James G. Gottling. Doctoral thesis. Rept. on Contracts AF 33(616)5489 and AF 33(616)5477 Feb 60, 234p. 29 refs. Rept. 7848-7849-R-12; AD-247 436.

DESCRIPTORS: Transducers, *Semiconductors, *Thin films, Thermodynamics, Design, Theory, *Resistance, Heat, Analog systems, *Thermoelectricity.

A theoretical investigation of the performance characteristics and limitations of a thin-film thermal transducer and an experimental verification of some of the results of this theoretical study are presented. The thermal transducer is a two-port, two-element electrical device which utilizes heat flow created by electrical power dissipated in an input resistor to control the resistance of an output element. When operated with appropriate input and output circuits, this device can perform mathematical analog operations of arithmetic, including multiplication, trigonometry and calculus. A thin-film thermal transducer was constructed and its static and dynamic characteristics measured. The agreement between the measured and calculated properties was satisfactory thus verifying the validity of the analysis. The gain-bandwidth product of the experimental transducer was of the order of 1 rad/sec. If a transducer were fabricated with the smallest area practical using present techniques (1 mm square), a gain-bandwidth product of the order of 30 rad/sec could be achieved. (Author)

PB 156 228 $7.60

[Electronic Systems] Lab., Mass. Inst. of Tech., Cambridge.
METHODS OF DETERMINING EFFECTS OF COMPONENT REDUNDANCY ON RELIABILITY, by Samuel Edward Estes. Master's thesis. Rept. on Contract AF 33(616)5477. Aug 58, 72p. 9 refs. Rept. 7849-R-3.

DESCRIPTORS: *Reliability, Failure (Mechanics), Diodes, Probability, *Electronic circuits, *Electric servomechanisms, Data processing systems, Mathematical computer data, Mathematical logic, Information theory, Cybernetics, Quality control.

Groups of components used redundantly are called elements and are classified according to whether (a) the function used to describe the reliability of the components is continuous or discrete, (b) component failures are intermittent or permanent, and (c) component failures are independent or dependent. The reliability measure, which takes into account the desired state of the element, is derived for general-dimensioned series-parallel elements made up of components that fail independently. A particular relation maintained between the length and width of the element gives the best reliability obtainable for a given magnitude of redundancy. A method, based on a Markov chain, is presented for determining the sequential reliability of elements composed of either independently or dependently failing components with discrete reliability functions and permanent failures. Results of this analysis show that the redundant element for these two classes is initially more reliable than the single component.

PB 156 230 $8.60

[Electronic Systems] Lab., Mass. Inst. of Tech., Cambridge.
A THEORY OF MULTIPLE-SCAN SURVEILLANCE SYSTEMS, by Robert S. Kennedy. Rept. on Contracts AF 33(616)5489 and AF 33(616)5477. May 59, 96p. 27 refs. Rept. 7848-7849-R-7; AD-217 730.

DESCRIPTORS: *Search radar, *Radar scanning, Radar equipment, Theory, *Antiaircraft defense systems, Design, Sequential analysis, Probability

Efforts were made (1) to provide a unified analysis of a complete surveillance system, consisting of sensory equipment (such as radar) and associated data-processing equipment, which repeatedly scans a prescribed search space and (2) to determine the form and parameters of a system which is optimum, in the sense that the mean time to target detection is a minimum subject to constraints on the noise classification time (which is a measure of the system's complexity) and the false-alarm probability. The assumptions underlying the study are that (1) the statistics of the input signal to the sensory equipment are known and stationary, (2) the input to the data-processing system on a particular scan is statistically independent of the input on previous scans, and (3) the target space may be represented by a discrete set of target points. The output, x, of the sensory equipment is completely described. Calculation of the optimum values of log A and log B requires trial-and-error solution of a system of equations. These equations are presented. Explicit expressions for the values of log A and log B which are approximately optimum are derived. The exact and approximate solutions are illustrated by examples drawn from the field of search radar.

PB 156 231 $11.50

Electronic Systems Lab., Mass. Inst. of Tech., Cambridge.
ULTIMATE PERFORMANCE LIMITATIONS OF LINEAR SAMPLED-DATA SYSTEMS, by Paul M. DeRusso. Doctoral thesis. Rept. on Contract AF 33(616)5477. June 59, 151p. 26 refs. Rept. 7849-R-8; AD-220 718.

DESCRIPTORS: *Control systems, Statistical analysis, Statistical functions, Electrical engineering, Servomechanisms, Signals, Sampling, *Linear systems, *Mathematical computer data, Electric filters, Noise analyzers, Electronic equipment, Tests

Sampled data systems are considered through the development of analytical design techniques which result in improved system designs and knowledge about the ultimate performance limitations of such systems. These analytical design techniques utilize a minimum mean square error criterion and incoporate constraints to account for the limited linear dynamic range of physical elements. The time average and the ensemble average are shown not to be equivalent in the case of sampled data systems operating on stationary stochastic inputs. The ensemble average results in correlation functions which are periodically time varying. As a consequence of this time variation, constraints may be placed upon the sampling-interval-averaged value, the peak value, or the instantaneous value of the mean square value of the signal to be constrained. Using these constraints, the conclusion is reached that: (1) saturation limits the performance of sampled data systems to the same extent that it limits the performance of continuous systems, and (2) a signal which contains noise should be filtered prior to being sampled. An expression for the transfer function of the optimum pre-filter is derived and simplifying combinations with the optimum post-filter are indicated.

Order from GPO $2.50 as FP 1.12:33

Federal Power Commission, Washington, D. C.
HYDROELECTRIC POWER RESOURCES OF THE UNITED STATES, DEVELOPED AND UNDEVELOPED, 1960. Rev. 1961, 209p.

DESCRIPTORS: *Electric power production, Sources, *Hydroelectric power systems, *Power plants, Power

This publication presents compilations and summaries of data as of January 1, 1960, on the water resources of the United States as related to the development of hydroelectric power. The compilations bring together available data on developed and undeveloped power in individual listings of existing hydroelectric plants and undeveloped power sites. The listings are grouped and arranged by major drainages and river basins and by geographic divisions and states. The data on both categories or power are summarized by the above groupings in tables showing the totals of the individual plant and site data.

PB 155 535 $6.60

Hughes Aircraft Co., Culver City, Calif.
STUDY OF NEUTRON-ELECTRON MULTIPLIERS, by John W. Clark. Final rept. on Contract DA 49-146-XZ 022. 17 Feb 61, 64p. 85 refs. DASA-1202; AD-252 021.

DESCRIPTORS: *Electron multipliers, Secondary emission, Particles, Neutrons, Particle trajectories, Thin films, Preparation, Cathodes (Electron tubes).

A satisfactory dynode structure was developed for high temperature operation. The secondary emission surfaces (MgO) will function satisfactorily up to temperatures of 600 C. However, the substrate used (Ag) in the form of an Ag-Mg alloy appears slightly unstable at this temperature. A practical upper limit would be 400 C. The activation cross-section for all materials used are low and those activities induced are of a relatively short half life (2.3 min. - 2.6 hr.). Exposure of the entire tube including the proposed quartz envelope to a thermal neutron flux of 10 to the 11th power n/sq cm/sec for 3 hr would produce a total activity of a few millicuries. This is in contrast to tubes having high temperature alumina ceramics in their composition. Such materials would increase the induced activity by a factor of several hundred. (Author)

PB 159 205 $11.00

[ITT Federal Lab.] Nutley, N. J.
SUBMARINE ANTENNA TUNING SYSTEM LOT II. Final rept. June 51-Sep 55 on Contract NObsr-52647. Apr 56, 146p. 7 refs.

DESCRIPTORS: *Submarine antennas, Antennas, *Tuning devices, Design, Test methods.

This report describes the development of three antenna tuning systems designed for use with submarine antennas. The first employs the mast tuner to tune a twenty-five foot, base-fed whip antenna mounted on a hinge mechanism at the top of a retractable mast external to the pressure hull. The second system uses the fairwater tuner to tune either the twenty-five foot, whip antenna or a standard split-whip antenna. Automatic or remote-manual operation of these tuners is provided, over a frequency range of two to twenty-six megacyles. The third is a manual tuner which is designed to match either a twenty-five foot, whip antenna, a split-whip antenna, or a wire-rope type antenna installed on a submarine, over a frequency range of three tenths to twenty-six megacycles. (Author)

UCRL-6576 $0.50

Lawrence Radiation Lab., U. of California, Livermore.
ONE-AMPERE COAXIAL PHOTODIODE, by Alfred L. Greilich. Rept. on Contract W-7405-eng-48. Aug 61, 25p.

UCRL-6529 $0.50

Lawrence Radiation Lab., U. of California, Livermore.
SYNTHESIS OF WAVE-FORMING NETWORKS, by J. W. LaPatra. Rept. on Contract W-7405-eng-48. Aug 61, 16p.

PB 159 275 $6.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
AN EFFICIENT ITERATIVE PROCEDURE FOR LOCATING THE OPTIMUM OPERATING POINT OF A NOISY SYSTEM, by Harold Kushner. Rept. on Contract AF 19(604)5200. 7 Dec 59, 67p. 3 refs. 22G-0011; AD-233 269.

DESCRIPTORS: *Numerical methods and procedures, *Noise (Radar), Analysis

An iterative numerical procedure for locating the point where a real time control system, such as a radar tracker, has its average maximum performance, is described. A procedure is outlined by which that iterative process adjusts itself to the particular curve. The adjustment of the process constants occurs in the course of the operation of the process, and the estimated values of these constants converge to the values that yield smallest mean-square error (the difference between the current iterate value and the location of the peak). If, as the iterates move towards the solution, the characteristics of the function in the latest region of iteration differ from the characteristics in the last region, the process constants are automatically readjusted to their new best values. The system is developed for curves bounded by 2 parabolas, but computer studies of the process show high efficiency of convergence for curves fitting that description as well as many which do not (such as, curves with a zero second derivative or a derivative discontinuity at the location of the peak). Theoretical and empirical results are very close. (Author)

AD-265 458 repriced $2.00

National Aviation Facilities Experimental Center, Atlantic City, N. J.
BEACON VIDEO DEFRUITING EQUIPMENT STORAGE TUBE TYPE 2.3NS9, by R. R. Barkalow and A. J. Penge. Final rept. Mar 61, 79p. Task no. 108-13-4T.

DESCRIPTORS: *Air traffic control systems, Identification systems, Radar equipment, *Radar interference, Video signals, Reduction, *Storage tubes, Tests, Radar beacons, Signal-to-noise ratio, Display systems, Effectiveness, Electron tubes

The FAA Type 2. 3NS9, storage tube defruiting equipment, was evaluated for compliance with the contract specification and for operational compatibility with the air traffic control radar beacon system. The equipment's ability to reject nonsynchronous reply signals in a ratio comparable to presently employed defruiting techniques was successfully demonstrated. The equipment's variable pulse repetition frequency makes it compatible with all radars presently employed in the air traffic control radar environment. (Author)

PB 161 622 $0.50

National Bureau of Standards, Boulder, Colo.
PRECISION CALIBRATION OF RF VACUUM TUBE VOLTMETERS, by L. F. Behrent. Dec 61, 19p. 5 refs. Technical note no. 121.

DESCRIPTORS: Radiofrequency, Electron tubes, *Voltmeters, Meters, Calibration.

Before any rf vacuum tube voltmeter is to be calibrated, it should be tested for several weeks to determine how well it may retain its calibration. In this way effort lost in trying to calibrate it to an accuracy beyond its inherent capabilities can be avoided. At voltmeters, Thermal Converters and RF Micropotentiometers as working standards provide simple, accurate and yet rapid means for calibrating vacuum tube voltmeters. (Author)

Order from GPO $1.75 as
D 202.6:C49

National Bureau of Standards, Washington, D. C.
HANDBOOK: PREFERRED CIRCUITS, NAVY AERONAUTICAL ELECTRONIC EQUIPMENT. 1 Sep 55, rev. 22 June 56. 202p. NAVAER 16-1-519.

DESCRIPTORS: *Electronic equipment, *Electronic circuits, *Naval aircraft, Handbooks, *Circuits, Standardization, Military equipment, Electrical engineering, Design, Direct current, Current regulators, Wiring diagrams.

The purpose of the Preferred Circuits Manual is to encourage better engineering practice in the design of circuits for military electronic equipment. The manual may be considered as a compilation of good design practice, not toward the limiting of effort in circuit design, but as a standard against which true progress in circuit design may be measured.

Order from GPO $0.60 as
D 202.6:C49/supp. 1

National Bureau of Standards, Washington, D. C.
HANDBOOK, PREFERRED CIRCUITS, NAVY AERONAUTICAL ELECTRONIC EQUIPMENT. 1 Aug 58, 117p. NAVAER-16-1-519, supp. 1.

DESCRIPTORS: *Electronic equipment, *Electronic circuits, *Naval aircraft, Handbooks, *Voltage regulator tubes, Voltage dividers, Transformers, *Circuits, *Power supplies, Airborne, *Fire control computers, Direct current, Temperature, Stability, Specifications, *Frequency stabilizers, *Delay circuits, Standardization.

Order from GPO $0.30 as
D 202.6:C49/supp. 2

National Bureau of Standards, Washington, D. C.
HANDBOOK, PREFERRED CIRCUITS, NAVY AERONAUTICAL ELECTRONIC EQUIPMENT. 1 Apr 59, 54p. NAVAER-16-1-519, supp. 2

DESCRIPTORS: *Electronic equipment, *Electronic circuits, *Naval aircraft, Handbooks, *Circuits, Power supplies, Voltage, Transistors, Direct current, Military equipment, Specifications, Crystal oscillators, Standardization.

Order from GPO $0.55 as
D 202.6:C49/supp. 3

National Bureau of Standards, Washington, D. C.
HANDBOOK, PREFERRED CIRCUITS, NAVY AERONAUTICAL ELECTRONIC EQUIPMENT. 1 Apr 60, 100p. NAVWEPS 16-1-519, supp. 3.

DESCRIPTORS: *Electronic equipment, *Electronic circuits, *Naval aircraft, Handbooks, Electron tubes, *Transistors, *Circuits, Specifications, Standardization, Reliability, Automation, Electrical engineering, Design, Voltage regulators, Direct current, Power supplies.

Order from GPO $0.35 as
D 202.6:C49/supp. 4

National Bureau of Standards, Washington, D. C.
HANDBOOK, PREFERRED CIRCUITS, NAVY AERONAUTICAL ELECTRONIC EQUIPMENT. 1 Oct 61, 59p. NAVWEPS 16-1-519, supp. 4

DESCRIPTORS: *Electronic equipment, *Electronic circuits, *Naval aircraft, Handbooks, *Subminiature electronic equipment, Electron tubes, *Transistors, *Circuits, Standardization.

TID-12681 $1.60

New Mexico U. Engineering Experiment Station, Albuquerque.
FREQUENCY RESPONSE OF A CLIP-ON AMMETER BASED ON THE HALL EFFECT, by Laurence L. Rosier and W. W. Grannemann. Progress rept. Feb 61, 12p. SCDC-2239.

UNM-TR-EE-54 $5.60

New Mexico U. Engineering Experiment Station, Albuquerque.
A THEORETICAL AND EXPERIMENTAL ANALYSIS OF A HALL GENERATOR IN A NON-UNIFORM MAGNETIC FIELD, by Lowell D. Watkins and W. W. Grannemann. May 61, 60p. SCDC-2344.

PB 159 228-1 $3.60

Nickel Cadmium Battery Corp., Easthampton, Mass.
RESEARCH STUDIES ON THE BEHAVIOR OF THE SINTERED PLATE NICKEL-CADMIUM BATTERY, by Arthur Fleischer. Quarterly rept. no. 1, 1 Mar-1 June 51, on Research Investigations to Study the Negative Plate and Devise Methods for Improving Performance, Contract DA 36-039-sc-5516. 30 June 51, 34p. 38 refs. ATI-112 060.

DESCRIPTORS: Nickel, Cadmium, *Alkaline cells, Storage batteries, Tests, Sintering, Anodes (Electrolytic cells).

Three-plate elements consisting of a single negative plate and a two-plate positive group have been assembled and formed. These test cells will be used to determine the cycling characteristics of the negative sintered plate at the five-hour, one-hour, and twenty-minute discharge rates. Methods of determining the distribution of cadmium as metal and as hydroxide in the active material have been studied. To date it appears that the negative plates used have almost all of the cadmium content as hydroxide. The experiments indicate that the cadmium distribution and the nickelous hydroxide in the negative active material may be determined by extraction of the plate in Muspratt solution, an aqueous solution of ammonium chloride and ammonium hydroxide. Cadmium acetate solution of a concentration suitable for impregnation has been prepared by reacting cadmium oxide and acetic acid. (Author)

PB 159 228-2 $5.60

Nickel Cadmium Battery Corp., Easthampton, Mass.
RESEARCH STUDIES ON THE BEHAVIOR OF THE SINTERED PLATE NICKEL-CADMIUM BATTERY, by Arthur Fleischer. Quarterly rept. no. 2, 1 June-1 Sep 51, on Research Investigations to Study the Negative Plate and Devise Methods for Improving Performance, Contract DA 36-039-sc-5516. 24 Sep 51, 57p. 8 refs. ATI-119 070.

DESCRIPTORS: Nickel, Cadmium, *Alkaline cells, Storage batteries, Tests, Sintering, Anodes (Electrolytic cells).

The assembly of cells and test results on cycling three-plate elements with a single negative plate of the size for BB221/V replacement batteries is described. The change in capacity on cycling at discharge rates of 3, 10 and 30 amperes was greatest at the 10 ampere rate. Sintering of mixtures of carbonyl nickel powder and iron oxide in a nitrogen atmosphere was not successful, probably due to the sulfate content of the iron oxide component that is reduced to sulfide during the sintering operation. Impregnation of plaques substituting cadmium acetate solution for cadmium nitrate solution resulted in plates with 70 to 80% of the cadmium content present as metal. Guanidine was found to be an inhibitor in cadmium nitrate solution with about the same effectiveness as Hibitite. Additional studies on the utilization of Muspratt solution for the estimation of the metallic cadmium content of the negative active material of sintered plates are reported. (See also PB 159 228-1)

PB 159 228-4. $7.60

Nickel Cadmium Battery Corp., Easthampton, Mass.
RESEARCH STUDIES ON THE BEHAVIOR OF THE SINTERED PLATE NICKEL-CADMIUM BATTERY, by Arthur Fleischer. Quarterly rept. no. 4, 1 Dec 51-29 Feb 52, on Research Investigations to Study the Negative Plate and Devise Methods for Improving Performance, Contract DA 36-039-sc-5516. 21 Mar 52, 78p. 6 refs. ATI-144 330.

DESCRIPTORS: Nickel, Cadmium, *Alkaline cells, Storage batteries, Tests, Sintering, Anodes (Electrolytic cell).

Cycling tests on cells consisting of one negative and two positive plates, all 0.062 inch thick and of the size provided for the BB 221/U replacement batteries, were continued. The original group of cells has been carried through cycle no. 170 at which point the tests were interrupted and the cells dismantled for examination of the negatives. Ten cells assembled in a plastic container having the same electrolyte volume as the BB 221/U, and about 1/10 of the volume of the cells reported above, were taken through 60 cycles. Twenty cells were assembled in plastic containers of the smaller electrolyte volume using negatives prepared under various conditions. (See also PB 159 228-2)

PB 159 228-5 $8.10

Nickel Cadmium Battery Corp., Easthampton, Mass. RESEARCH STUDIES ON THE BEHAVIOR OF THE SINTERED PLATE NICKEL-CADMIUM BATTERY, by Arthur Fleischer. Quarterly rept. no. 5, 1 Mar-31 May 52, on Research Investigations to Study the Negative Plate and Devise Methods for Improving Performance, Contract DA 36-039-sc-5516. 23 June 52, 84p. 14 refs. ATI-156 304.

DESCRIPTORS: Nickel, Cadmium, *Alkaline cells, Storage batteries, Tests, Sintering, Anodes (Electrolytic cell).

Saran (polyvinylidene chloride) filament used as separator in the assembly of the BB 221/U batteries dissolves in the alkaline electrolyte. The solubility of cadmium hydroxide in potassium hydroxide electrolyte appears to be a function of the carbonate content for constant total alkalinity. Increase in concentration of potassium hydroxide in the electrolyte from 25% by weight to 30% has no effect on the loss of capacity. The coefficient of utilization of the negative active material appears to be highest for plates for which the current density of cathodic polarization was held at 0.2 or 0.3 ampere per square inch. The formation of metallic cadmium in the active material during the impregnation process has an unfavorable effect on the coefficient of utilization at high discharge rates. The loss of capacity on cycling at the 37.5 ampere rate at 0°F is much slower than at room temperature. A change of the electrolyte in cells cycled at the high discharge rates, 30 and 37.5 amperes, tended to increase capacity on the following cycle with a subsequent tendency to lower capacity to the expected level. Cycling at the high discharge rate of 37.5 amperes is a suitable screening test for studying variables of plate preparation. (See also PB 159 228-4)

PB 159 228-6 $9.10

Nickel Cadmium Battery Corp., Easthampton, Mass. RESEARCH STUDIES ON THE BEHAVIOR OF THE SINTERED PLATE NICKEL-CADMIUM BATTERY, by Arthur Fleischer. Quarterly rept. no. 6, 1 June-31 Aug 52, on Research Investigations to Study the Negative Plate and Devise Methods for Improving Performance, Contract DA 36-039-sc-5516. 23 Sep 52, 101p. 4 refs. ATI-168 999.

DESCRIPTORS: Nickel, Cadmium, *Alkaline cells, Storage batteries, Tests, Sintering, Anodes (Electrolytic cell).

Preparation of plates including polarization in cans permitting a greater separation of the cathode from the anodes led to an improvement in the behavior on cycling. Negative plates cycled at the 37.5 ampere rate for the first 74 cycles for a limited discharge period lost capacity at a lower rate than for complete discharge. Negative plates cycled at the 37.5 ampere rate for 70 cycles at 0°F, including the charging at this temperature, have higher capacities on subsequent cycles at room temperature than cells cycled only at room temperature. The irreversible loss of capacity on cycling is connected with the recrystallization of cadmium metal rather than with the coarsening of cadmium hydroxide crystals. (See also PB 159 228-5)

PB 155 175 $3.60

Rome Air Development Center, Griffiss AFB, N. Y. EVALUATION OF TELETYPE MULTIPLEX EQUIPMENT AN/TCC-35, by David A. Bone and Stanley E. Shaw. Dec 60, 35p. RADC-TR-60-231; AD-252 524.

DESCRIPTORS: *Teletype equipment, Multiplex transmission, Tests, Test equipment, Maintenance, Electronic circuits, Ionospheric propagation, Radio waves, Scattering.

A test program conducted by the USAF on the AN/TCC-35 Teletype Multiplex Equipment is described. It was possible to draw a number of conclusions based on these tests. (1) The mechanical engineering of the AN/TCC-35 must be improved with regard to packaging of units. There is insufficient ventilation area for the test oscilloscope, and its location does not permit easy use of it for maintenance, (2) The type of relay in the Voltage-to-Current Converter is not adequate, (3) The receive channel output load now in the AN/TCC-35 is not as reliable as a good polar signal relay would be. (4) Tolerance of the input circuits of the Transmitter Code Converter is too narrow; it will not function with a 10% or more drop in line current. (5) Investigation of encapsulating techniques for diodes, magnetic cores, and transistors was not sufficient, and these devices do not function well in the equipment, and (6) In its present form, the AN/TCC-35 is unsuitable for integration with existing USAF radio and TTY communications equipment and with USAF security equipment used in the STRATCOM system. (Author)

M-6111 $2.60

Sandia Corp., Albuquerque, N. Mex. LEAKAGE CURRENT OF TANTALUM CAPACITORS, by C. B. Pearlston, Jr. Jan 56, 24p. SCTM-15-56-14-A.

PB 155 019 $4.60

Stanford Electronics Labs., Stanford U., Calif. PARAXIAL PROPERTIES OF CROSSED-FILED ELECTRON SHEET BEAMS, by William E. Waters. Topical rept. on Contract DA 36-039-sc-73178. May 59, 45p. 18 refs. S. E. L. Technical rept. no. 901-2; M. L. rept. no. 603.

DESCRIPTORS: *Electron beams, Focusing, Synthesis, Electromagnetic fields, Numerical analysis, Differential equations, Electrons, Cathodes (Electron tubes)

The equation of motion for an electron at the edge of a sheet beam, subject to electrostatic forces in the plane of motion and a uniform crossed magnetic field normal to the plane of motion, is presented in the paraxial approximation. A number of solutions of the equation are obtained. Stiffness of various focusing systems is quantitatively discussed. Methods for using the equation to design crossed-field electron guns are described. The validity of the paraxial approximation is discussed, after comparing paraxial calculations with two known exact solutions of Poisson's equation. (Author)

PB 159 271 $5.60

Armour Research Foundation, Chicago, Ill.
MAGNESIUM-LITHIUM-ALUMINUM ALLOYS FOR ARMORED VEHICLE APPLICATION, by Adolph W. Goldenstein and Arthur G. Metcalfe. Final rept. 22 Nov 57-21 Nov 58, on Contract DA 11-022-507-ORD-2621. 14 Jan 59, 59p. 2 refs. ARF Proj. B 136; AD-212 807.

DESCRIPTORS: *Magnesium alloys, *Lithium alloys, *Aluminum alloys, Armored vehicles, Alloys, Materials, *Armor plate, Metal plates, Mechanical properties, Processing, Corrosion-resistant alloys, Determination, Tensile properties, Tests, Melting, Solids, Corrosion, Resistance.

The original purpose of the work was to select the optimum composition of Mg-Li-Al alloy on the basis of ballistic, mechanical and physical properties. However, it became apparent from the preliminary results, as well as from results from other sources on the large-scale production of ballistic plate, that the melting, casting, and working techniques were more important at this stage than effects due to composition. Accordingly, the scope of the work was modified to investigate these variables on the Mg-13.5 Li-5.5 Al alloy. Considerable improvement in the properties, particularly in the short transverse direction, have been made as a result of this investigation with some improvement in the ballistic properties. (Author)

AD-256 022 $5.60 Not announced by ASTIA

Armour Research Foundation, Chicago, Ill.
MAGNESIUM-LITHIUM-ALUMINUM ALLOYS FOR ARMORED VEHICLE APPLICATIONS, by John T. Berry, A. H. Murphy, and P. R. Gouwens. Final rept. 3 Dec 59-3 Apr 61, on Contract DA 11-022-507-ORD-3262. 3 Apr 61, 59p. 3 refs. ARF 2190-15.

DESCRIPTORS: *Magnesium alloys, *Lithium alloys, Armored vehicles, Alloys, Materials, *Armor plate, Metal plates, Mechanical properties, Processing, Corrosion-resistant alloys, Determination, Tensile properties, Tests, Melting, Solids, Corrosion, Resistance.

A melting, solidifying and primary and secondary working treatment is described which results in superior short-transverse strength of two-inch thick plate in β Mg-Li alloys. Enhancement of this property is known to be linked to increase in ballistic limit. The mechanical properties proved to be sensitive to composition and also time-temperature relations during deformation. In addition, the base alloy proved to be sensitive to quench cracking in the thick sections associated with processing to two-inch plate. The corrosion resistance of the series of the twenty-one compositions involved in the investigation was determined by using the standard alternate immersion test in 3% saline solution. Upon the basis of the tests the 13% lithium series (3-5% Al) are superior to the remaining alloys. (Author) (See also PB 159 271)

Order from GPO $0.30 as SI 1.12/2:5/9

Astrophysical Observatory, Smithsonian Institution, Cambridge, Mass.
ROTATION OF AN EARTH SATELLITE IN FLIGHT ALONG ITS ORBIT, by Yusuke Hagihara. 1961, 31p. Smithsonian Contributions to Astrophysics v. 5, no. 9. AD-263 630.

DESCRIPTORS: *Satellite vehicles, *Orbital flight paths, *Rotation, Satellite vehicle trajectories, Motion, Oscillation, Hydrodynamics, Mathematical analysis, Integration, Electric fields, Space environmental conditions, Electrostatic fields.

The rotational motion of an earth satellite during the period of its flight along its orbit around the earth's center is discussed. The discussion is based on Euler's equations of motion for the rotation of a rigid body around its center of mass. The effect of tidal torque is fully discussed for the cases of a circular and an elliptic orbit. The figure of the earth is assumed to be spherical. The instantaneous orientation of the satellite body is referred to a coordinate system that is fixed in space. It is shown that this frame should be such that its Z-axis is directed to the north pole of the orbital plane of the satellite, and that the body makes a precessional motion of long period around this Z-axis; on this motion is superimposed the nutation of short period, of the order of the satellite's orbital period. (Author)

PB 156 516 $2.60

Frankford Arsenal, Philadelphia, Pa.
NOZZLE SPRING DESIGN FOR 90 mm RECOILLESS RIFLE T234; by A. J. Grandy, July 59, 27p. Memo. rept. M59-37-1; AD-251 745.

DESCRIPTORS: *Recoilless rifles, Design, Springs, Nozzles, Helical springs.

The object of this study is to design and to develop manufacturing methods for a spring to control the leaves of an expansible nozzle for the 90 mm Recoilless Rifle T234. The problem which required solution lay in the difficulty of using a conventional helical spring, which not only failed to provide a uniform concentric thrust, but also caused binding by the telescoping of turns, and by a relative skewing of the ends under compression. (Author)

PB 159 305 $8.10

Inter-Range Instrumentation Group, White Sands Missile Range, N. Mex.
IRIG TELEMETRY STANDARDS. Nov 60, reissued Apr 61, 86p. IRIG Document no. 106-60, supersedes IRIG Recommendations no. 101-55, 101-57, 101-60, 102-55, 102-59, and 103-56; AD 253 641.

DESCRIPTORS: *Telemeter systems, Standards, Radiofrequency, Frequency modulation, Phase modulation, *Multiplex transmission, Pulse modulation, *Magnetic recording systems, Errors, Test methods, Test equipment.

Contents:
Radio frequencies
FM/FM or FM/PM standards
PDM/FM or PDM/PM standards
PAM/FM or PAM/PM standards
PCM standards
Magnetic tape recorder/reproducer standards
Standards for testing for speed errors in magnetic tape recorder/reproducer

UCRL-6189 $1.10

Lawrence Radiation Lab., U. of California, Livermore.
THE "NEAR" MAGNETIC INDUCTION SIGNAL FROM A NUCLEAR EXPLOSION DUE TO MOVEMENT OF THE EARTH'S MAGNETIC FIELD, by Stirling A. Colgate. Rept. on Contract W-7405-eng-48. Nov 60, 9p.

PB 155 979 $2.60

McCrone, Walter C., Associates, Chicago, Ill.
THE CRYSTALLOGRAPHY OF EXPLOSIVES. PHASE I. CRYSTAL STRAIN IN LEAD AZIDE. PHASE II. CRYSTAL STRUCTURE OF LEAD STYPHNATE, by Walter C. McCrone and Leonid V. Azaroff. Quarterly rept. no. 3, 1 Nov 60-1 Mar 61, on Contract DA 11-022-ORD-3412. 1 Apr 61, 24p. 1 ref.

DESCRIPTORS: *Lead compounds, Azides, *Explosives, *Crystal structure, Styphnates.

Sufficient evidence has been presented to prove that both crystal size and growth rate are important in determining whether lead azide detonates spontaneously. Strong indirect evidence is presented to show that crystal strain is the cause of spontaneous detonation. (See also PB 154 083)

Order from GPO $0.30 as NAS 1.12:83

National Aeronautics and Space Administration, Washington, D. C.
THEORETICAL STUDY OF THE ANGULAR MOTIONS OF SPINNING BODIES IN SPACE, by Jerrold H. Suddath. 1961, 12p. NASA Technical rept. R-83; AD-245 405.

DESCRIPTORS: *Spaceships, Satellite vehicles, Motion, *Spin, *Dynamics

Euler's dynamic equations were linearized and solved analytically. Analytical expressions which relate angular motions to spin-rate and inertia distributions were obtained and found to be in good agreement with machine solutions of the nonlinear equations for the case of a rectangular-pulse pitching-moment disturbance. The effects produced by having artificial damping in the system are considered. (Author)

Order from GPO $0.40 as NAS 1.12:99

National Aeronautics and Space Administration, Washington, D. C.
THEORY OF THE SECULAR VARIATIONS IN THE ORBIT OF A SATELLITE OF AN OBLATE PLANET, by William A. Mersman. 1961, 34p. NASA Technical rept. R-99; AD-254 359.

DESCRIPTORS: *Satellite vehicles, Planets, *Orbital flight paths, *Satellite vehicle trajectories, Theory

The theory of satellite orbits about an oblate planet is studied by means of a new set of canonical variables. The Hamiltonian function is separated into two parts, one of which is neglected. The neglected part is periodic with mean value equal to zero, and it vanishes when the inclination is zero. Thus the solution obtained by neglecting this part of the Hamiltonian is exact for equatorial orbits; for inclined orbits the secular motion of the node and perigee are obtained correctly to the second order in the oblateness parameter. (Author)

PB 161 535(Rev. 3) $0.75

Office of the Director of Defense Research and Engineering, Washington, D. C.
TECHNICAL RESOURCES DIRECTORY: MISSILE GROUND SUPPORT EQUIPMENT NO. 5. 1 Nov 61, 26p.

DESCRIPTORS: *Guided missiles, *Military equipment, Directories.

Through its extensive research and engineering programs, the Department of Defense is developing material and equipment designed to meet present and future military requirements. The diverse tasks embraced in these programs range throughout the broad scope of military activities. This directory of military technical resources is intended to encourage communication in the Military Departments and in industry in the area of ground support equipment for missile systems. (Supersedes issue no. 4, 1 May 61, PB 161 535 (Rev. 2)

PB 159 425-1 $19.75

Thiokol Chemical Corp., Bristol, Pa.
RESEARCH AND DEVELOPMENT OF RIGID URETHANE FOAM MATERIALS FOR STRUCTURAL SANDWICH APPLICATION, by John M. Genouese, D. A. Petrino, and R. C. Laney. Phase I, Final rept. on Contract NOrd-18617. 29 June 59, 301p. 8 refs. Rept. no. A242R2.

DESCRIPTORS: Guided missiles, *Sandwich panels, *Sandwich construction, *Honeycomb cores, Materials, *Urethanes, *Foams, Test methods, Test equipment, Tests, Physical properties

Rigid urethane foams of various molecular structures and formulations have been studied as core materials for sandwich panels. Standard procedures for sample and specimen preparation, and bonding of core and sandwich specimens to metal loading blocks have been established. Natural adhesion of rigid urethane core materials to metal substrates has been investigated. Test data results for the core and sandwich specimens have been evaluated. The limited analytical studies of test data show conclusively that both the R322/ZL236 and R334/C334-R2 foams are structurally adequate for use as core material in sandwich construction.

PB 159 425-2 $16.00

Thiokol Chemical Corp., Bristol, Pa.
RESEARCH AND DEVELOPMENT OF RIGID URETHANE FOAM MATERIALS FOR STRUCTURAL SANDWICH APPLICATION, by J. M. Genouese, D. A. Petrino, and S. Moszer. Phase II, Final rept. on Contract NOrd-18617. 20 Feb 60, 250p. 6 refs. Rept. no. A242AR2.

DESCRIPTORS: Guided missiles, *Sandwich panels, *Sandwich construction, *Honeycomb cores, Materials, *Urethanes, *Foams, Test methods, Test equipment, Tests, Physical properties

R334 was selected for use as core material for both flat and cylindrical specimens. Flat sandwich specimen adhesion studies indicate that techniques for bonding of foamed-in-place Rigithane 334 to aluminum alloy facings are adequate for good structural properties. Fungus tests, and tests at temperatures of -65° F and 120° F indicate no adverse effects on the properties of the foam. Data has been derived and techniques developed for foaming simulated liner or container sections (60-in. diameter; 48-in. height; 2-in. wall thickness) with cores of Rigithane 334 foam in both 4 and 8 lb./cu. ft. densities. Full scale compressive tests of these sections indicate that the foam stabilized the .063 aluminum alloy skins to a high degree.

Sanitation and Safety Engineering

APAE-2(Rev. 1) (Suppl. 1) $1.60

Alco Products, Inc., Schenectady, N. Y.
HAZARDS REPORT FOR THE BF_3 WITHDRAWAL MECHANISM IN THE SM-1, by J. R. Coombe. Rept. on Contract AT(30-1)-2639. Oct 61, 14p.

BMI-1559 $2.25

Battelle Memorial Inst., Columbus, Ohio.
THE DEVELOPMENT AND EVALUATION OF SAFETY PERFORMANCE CRITERIA FOR SEALED RADIATION SOURCES, by Charles W. Townley, Joseph M. Fackelmann and others. Rept. on Contract W-7405-eng-92. Dec 61, 95p.

HW-68183 $2.60

Hanford Atomic Products Operation, Richland, Wash.
REACTOR SAFETY REVIEW, by G. C. Fullmer and R. W. Reid. Jan 61, 23p.

HW-69587(Rev.) $1.60

Hanford Atomic Products Operation, Richland, Wash.
SAFETY REVIEW OF HANFORD LABORATORIES PILOT PLANT FACILITIES, by W. A. Snyder. Rept. on Contract AT(45-1)-1350. Nov 61, 16p.

HW-68081 $5.60

Hanford Atomic Products Operation, Richland, Wash.
STRONTIUM-90 SHIPPING CASK DESIGN CRITERIA AND HAZARDS EVALUATION, by C. W. Smith. Rept. on Contract W-31-109-eng-52. Jan 61, declassified. 68p.

TID-13648 $1.60

Harvard School of Public Health, Boston, Mass.
RESEARCH AND DEVELOPMENT OF PROTECTIVE RESPIRATORY EQUIPMENT. Progress rept. 1 Apr-1 July 61, on Contract AT(30-1)-2355. Sep 61, 12p.

UCRL-6654 $1.00

Lawrence Radiation Lab., U. of California, Livermore.
A STUDY OF DESIGN AND COST DATA FOR FAMILY AND SMALL-GROUP FALLOUT SHELTERS. Rept. on Contract W-7405-eng-48. Oct 61, 42p.

UCRL-9657 $0.50

Lawrence Radiation Lab., U. of California, Berkeley.
THE WATER-SHIELDED CAVE FACILITY FOR TOTALLY ENCLOSED MASTER-SLAVE OPERATIONS AT LAWRENCE RADIATION LABORATORY, by Patrick W. Howe, Thomas C. Parsons, and Leonard E. Miles. Rept. on Contract W-7405-eng-48. Oct 61, 31p.

SCR-163 $0.50

Sandia Corp., Albuquerque, N. Mex.
ATMOSPHERIC SIGNALS FROM EXPLOSIONS AND THEIR INTERPRETATION, by J. W. Reed. Nov 61, 24p.

MACHINERY, FABRICATION, AND ACCESSORY EQUIPMENT

PB 158 071 $5.60

Laboratories for Research and Development, Franklin Inst., Philadelphia, Pa.
THEORY AND DESIGN DATA FOR CONTINUOUS-FILM SELF-ACTING JOURNAL BEARINGS OF FINITE LENGTH, by Harold G. Elrod, Jr. and Stanley B. Malanoski. Interim rept. on Contract Nonr-2342(00). Nov 60, 55p. 11 refs. Rept. no. I-A2049-13; AD-248 483.

DESCRIPTORS: *Journal bearings, *Gas bearings, Design, Theory, Mathematical analysis, Numerical analysis, *Lubrication, Bearings.

The general theory of continuous-film lubrication is presented. The results for gas-lubricated bearings are shown to be capable of generalization to any fluid with a linear-pressure-density relation. In particular, the results are applicable to lightly-loaded bearings employing any single-phase substance. Gas-bearing design formulas for both infinite and finite-length bearings are summarized. A new analysis for edge-effects in finite gas-bearings operating at high speed is presented. Finally, rapid slide-rule methods are illustrated for constructed load coefficient and attitude angle curves. (Author)

Engines and Propulsion Systems

TID-13905 $1.60

Aerojet-General Corp., Azusa, Calif.
SNAP-8, THE FIRST ELECTRIC PROPULSION POWER SYSTEM, by P. I. Wood, D. L. Forrest, and B. M. Wilner. Oct 61, 18p.

AGN-8039 $3.60

Aerojet-General Nucleonics, San Ramon, Calif.
RUBIDIUM AND CESIUM EVALUATION PROGRAM. Quarterly technical rept. no. 2, 1 May-31 July 61, on Contract AT(04-3)-368. 20p.

AD-262 436 $3.60 Not announced by ASTIA

National Research Labs., Ottawa (Canada).
A RESUME OF SIMULATION TECHNIQUES AND ICING ACTIVITIES AT THE ENGINE LABORATORY OF THE NATIONAL RESEARCH COUNCIL (CANADA), by M. S. Chappell. May 61, 32p. 2 refs. Aeronautical rept. LR-305; NRC no. 6354.

DESCRIPTORS: *Airplane engines, Test facilities, Simulation, Measurement, *Turbojet engines, *Ice prevention, Tests, Axial flow compressors, Guide vanes, Aerodynamics, Canada, De-icing systems.

This paper presents a brief description of the facilities available for aircraft engine icing studies at the Engine Laboratory of the National Research Council (Canada), together with a more detailed discussion of simulation and measurement techniques. Test results from the past few seasons are presented in the form of observed phenomena associated with general engine and anti-icing system types rather than as data from specific engine test programmes. (Author)

PB 159 273 $6.60

Union Carbide Research Inst., Tuxedo, N. Y.
RESEARCH IN PHYSICAL AND CHEMICAL PRINCIPLES AFFECTING HIGH TEMPERATURE MATERIALS FOR ROCKET NOZZLES, by Robert Lowrie. Semiannual progress rept. 1 Jan-30 June 60, on Contract DA 30-069-ORD-2787, 30 June 60, 61p. 23 refs. AD-239 305.

DESCRIPTORS: *Refractory materials, *Rocket motor nozzles, Erosion, Vaporization, Heat transfer, Specific heat, Mechanical properties, Elasticity, Spectrographic analysis, X-ray diffraction analysis

Studies of the nature of species arising directly from solid surfaces by evaporation were pursued utilizing mass and IR spectroscopy and matrix-isolation techniques. Evidence was obtained for the presence of B_2O_3 and C_3 in B_2O_3 and C vapors, respectively. Measurements of the heat of vaporization of Pd made with a new wide-range mass spectrometer of high resolving power gave an approximate value of 93 kcal/mol. Studies on the reactions of N and H atoms with solid surfaces indicated that H atoms react with C at room temperature, but that N atoms and C do not react until a temperature of about 1350°C is attained. Thermal conductivity data were obtained for C, graphite, and several refractory metals including Ti and Zr by use of an improved version of the Longmire technique. An extension of this method was developed using transient heating to measure the specific heats of solids. Data on the spectral emissivities of certain single crystals were obtained over the range of 725° to 2125°C. Values for the 2 extremes of temperature were: 0.40 and 0.32 for TiC; 0.26 and 0.24 for TiB_2; and 0.28 and 0.22 for NbC.

Manufacturing Equipment and Processes

PB 155 553 $6.60

Electronic Systems Lab., Mass. Inst. of Tech., Cambridge.
AUTOMATIC FEEDRATE REGULATION IN NUMERICALLY CONTROLLED CONTOUR MILLING, by Jerry D. Welch. Master's thesis. Rept. on Contracts AF 33(600)24007 and AF 33(600)40604. Dec 60, 69p. 19 refs. Rept. 8436-R-1; DSR-6873; DSR-8436; AD-253 676.

DESCRIPTORS: *Machine tools, Control systems, *Milling machines, Automation, Computers, Programming, Feedback amplifiers, Digital computers, Thermoelectricity

The application of continuous path numerical control and tracer control to machine tools has increased the need for a more automatic and accurate method of feedrate selection. A method of using a feedback signal from the cutting process to determine the desired feedrate is presented as a solution to this problem. The choice of the proper feedback signal is first considered. It is shown that whereas a computer regulation system is best suited to controlling the metal removal rate, a feedback regulation system is best suited to controlling the tool wear rate. The tool temperature is known to be the output of the cutting process which is most closely related to the tool wear rate. The method chosen for detecting the tool temperature is the tool-work thermocouple technique. An experimental system for regulating the feedrate of the M. I. T. numerically controlled milling machine is described. The results show that subject to certain restrictions the tool-work thermal emf can be successfully fed back to control the machine feedrate so as to keep the cutting temperature essentially invariant to changes in the cross section of the cut. (Author)

PB 181 098 $5.00

Vought Aeronautics Div., Chance Vought Corp., Dallas, Tex.
THEORETICAL FORMABILITY. VOLUME I: DEVELOPMENT, by W. W. Wood, R. E. Goforth and others. Rept. Mar 60-July 61, on Contract AF 33(616)6951. Aug 61, 382p. 34 refs. ASD TR-61-191(I).

DESCRIPTORS: Aircraft, Materials, Metals, *Sheets, Processing, Mechanical properties, Mathematical prediction, Metal forming brakes, Metal forming presses, Rolling mills, Drawing (Machine processing), Dies, Manufacturing methods, Design

The "cut-and-try" method of determining sheet metal formability has long been the standard practice in the aircraft industry. This report presents methods of determining formability analytically for the twelve most common processes of forming sheet metal. This method is based on utilization of a material's mechanical properties to predict formability. Volume I gives the procedure used to arrive at the objective of predicting formability. First, basic limit equations are developed relating geometry of the parts to the material properties. These equations are used to determine the shape of the limit graphs to give indices relating formability to the material. Then, experimental parts are formed to position the theoretically shaped curves with the aid of the formability indices. (Author)

PB 181 099 $6.00

Vought Aeronautics Div., Chance Vought Corp., Dallas, Tex.
THEORETICAL FORMABILITY. VOLUME II. APPLICATION, by W. W. Wood, R. E. Goforth and others. Rept. Mar 60-July 61, on Contract AF 33(616)6951. Aug 61, 482p. ASD TR 61-191(II).

DESCRIPTORS: Aircraft, Materials, Metals, Alloys, Magnesium, Aluminum, Titanium, Stainless steel, Tool steel, Nickel, Cobalt, Refractory materials, *Sheets, Manufacturing methods, Handbooks, Metal forming brakes, Metal forming presses, Rolling mills, Drawing (Machine processing), Dies, Design

Volume II is presented in handbook form giving design and manufacturing information for the nineteen materials in the program. These materials covered some of the most currently used alloys in the following categories: (1) magnesium, (2) aluminum, (3) titanium, (4) stainless steel, (5) tool steel, (6) nickel and cobalt base, and (7) the refractory metals. Graphs, equations, and design tables are presented for each process, statistically proven with experimental work comprising a total of approximately twenty-one-thousand formed parts. (Author) (See also PB 181 098)

Transport, Traction and Hoist Facilities

Order from GPO $3.00 as
D 103.8:42

Board of Engineers for Rivers and Harbors, Washington, D. C.
UNITED STATES PORTS ON LAKE ERIE. PART 2. ERIE, PA.; FAIRPORT, OHIO; CONNEAUT, OHIO; LORAIN, OHIO; HURON, OHIO; ASHTABULA, OHIO; SANDUSKY, OHIO. 1961, rev. 1960, 126p. Port Series no. 42.

DESCRIPTORS: *Harbors, *Great Lakes, Ohio, Pennsylvania, Meteorological data, *Shipping, *Transportation, *Cargo, Handling, Storage, Bridges, Hoists, Piers, Warehouses, Coal, Oils, Ores, Railroads, Maintenance.

Information is included on:
Port and harbor conditions: location and general description; harbor and channel improvements by the United States; harbor and channel improvements by local interests; anchorages; bridges; weather conditions; meteorological data for 1960

Port and harbor facilities: piers, wharves, and docks; oil bunkering and oil handling; oil handling facilities; ore handling; grain elevators; hoisting facilities - ashore and afloat; coal handling and coal bunkering; storage warehouses; open storage; marine repair plants, drydocks and marine railways; floating equipment; rail lines - assembly, classification and storage yards.

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D 103.2:B76/pt. 2

Engineer Corps, Washington, D. C.
BRIDGES OVER THE NAVIGABLE WATERS OF THE UNITED STATES. PART 2. GULF AND MISSISSIPPI RIVER SYSTEM. 1961, 67p.

DESCRIPTORS: *Bridges, Tables, *Inland waterways, *Navigation, Gulf of Mexico, Traffic.

Data listed in tabular form include: miles above mouth, location, owner, type of bridge, clearance (horizontal, vertical) date plans approved, and type of traffic.

Order from GPO $0.25 as
D 103.2:B76/pt. 3

Engineer Corps, Washington, D. C.
BRIDGES OVER THE NAVIGABLE WATERS OF THE UNITED STATES. PART 3. GREAT LAKES. 1961, 21p.

DESCRIPTORS: *Bridges, Tables, *Inland waterways, *Navigation, Great Lakes, Traffic.

Data listed in tabular form include: miles above mouth, location, owner, type of bridge, clearance (horizontal, vertical), date plans approved, and type of traffic.

Order from GPO $0.25 as
D 103.2:B76/pt. 4

Engineer Corps, Washington, D. C.
BRIDGES OVER THE NAVIGABLE WATERS OF THE UNITED STATES. PART 4. PACIFIC COAST. 1961, 31p.

DESCRIPTORS: *Bridges, Tables, *Inland waterways, *Navigation, San Francisco Bay, San Diego Bay, Traffic.

Data listed in tabular form include: miles above mouth, location, owner, type of bridge, clearance (horizontal, vertical), date plans approved, and type of traffic.

Order from GPO $2.25 as
D 103.10:4/961

Engineer Corps, Washington, D. C.
TRANSPORTATION LINES ON THE MISSISSIPPI RIVER SYSTEM AND THE GULF INTRACOASTAL WATERWAY, 1961. 1960, 412p. Transportation Series 4.

DESCRIPTORS: *Transportation, *Shipping, Cargo, Navigation, Railroads, Passenger vehicles, *Inland waterways, Merchant vessels, Operation, *Gulf of Mexico, Marine engineering.

This is the annual revision of a report containing information on the transportation lines and their vessels operating on waterways of the Mississippi River System and the Gulf Intracoastal Waterway. This report only covers vessels operating under the American flag. The report includes a description of vessels either operating or available for operation on the Mississippi River System and the Gulf Intracoastal Waterway on 31 December 1960, and lists numerous unrigged craft not described in other publications. The names of the transportation lines (companies or individuals) numbering 1059 in all are arranged in an alphabetical index. Table 2 lists the various transportation lines in alphabetical sequence. Table 3 gives a description of the operations of the transportation lines.

PB 161 620 $2.25

National Bureau of Standards, Washington, D. C.
COMPUTER SIMULATION OF STREET TRAFFIC, by M. C. Stark. Nov 61, 94p. 1 ref. Technical note 119.

DESCRIPTORS: *Traffic, District of Columbia, Simulation, Digital computers, Computers, Scheduling

An element-by-element computer simulation of the volume and movement of traffic on a nine-block section of 13th Street N. W., in Washington, D. C. is described. A stochastic process is used, in which the input parameters defining the operating and physical characteristics of the cars are controllable within narrow ranges. The computer reviews each simulated car every quarter second and moves it according to rules for movement which are applied by 37 main routines and sub-routines of the computer program. The simulation run on the computer produces two outputs: The quarter-second car positions are plotted on an oscilloscope and photographed, which result in a moving picture like an animated cartoon, so they can be seen in real time. The other output is a series of tables issued by the computer. These tables catalog all vehicles as they enter the model, clock and count them as they pass a key intermediate point, and finally, check them out at the end of the course, counting them again and noting their individual running times.

AD-264 821 repriced $2.25

United Research, Inc., Cambridge, Mass.
FORECAST OF LOSSES INCURRED BY U.S. COMMERCIAL AIR CARRIERS DUE TO INABILITY TO DELIVER PASSENGERS TO DESTINATION AIRPORTS IN ALL-WEATHER CONDITIONS: 1959 - 1963. Rept. on Contract FAA/BRD-309. Mar 61, 85p. 16 refs.

DESCRIPTORS: *Air transportation, Transport planes, Flight, Costs, Climatic factors, Meteorology

The findings indicate that U. S. airlines incur losses of approximately $55 million a year due to flight disruptions in periods when weather conditions are below authorized limits. Due to increased traffic and increases in the costs of operating aircraft, these losses will increase to over $65 million by 1963. The growing proportion of jet aircraft in the carriers' fleets is one of the major factors accounting for the cost increases since costs of delay are far greater for jet aircraft than for piston aircraft because of the higher hourly operating expense of the former. The losses take the form of (1) cash losses when airlines are forced to cancel, delay or divert their schedules, (2) short and long term costs resulting from landing accidents, and (3) losses from reduction in the demand for air travel due to its present unreliability in bad-weather periods. The costs considered in this report were of an incremental and direct nature only. If flight depreciation expense and all indirect and overhead expense were allocated to the aircraft time consumed in delays, diversions and cancellations, the costs would have been considerably higher than those shown. (Author)

MATERIALS

PB 156 239 $11.50

[Electronic Systems] Lab., Mass. Inst. of Tech., Cambridge.
NEW TECHNIQUES AND EQUIPMENT FOR CORRELATION COMPUTATION, by James F. Kaiser and Roy K. Angell. Rept. on Contract AF 33(616)3950. Dec 57, 153p. 94 refs. Technical memo. no. 7668-TM-2.

DESCRIPTORS: *Correlation techniques, Statistical functions, Analog computers, Digital computers, *Computers, Design.

The underlying theory of the correlation function and its calculation are summarized and the effects of finite averaging time, sampling, and quantization are discussed. A classification of types of correlation computers is introduced and is followed by a detailed survey and description of the many components and circuits which may be used to perform the required mathematical operations. Using the component survey as a basis, two correlator designs for a particular requirement - one analog and the other analog-digital - are outlined and discussed in detail. A comprehensive bibliography is included. The design and operation of a two-level real-time correlator is described. This correlator, which was constructed to experiment with two-level quantization, is designed around the ability of the magnetic-core shift register to accept and store, in time sequence, information which has been given in the form of the binary digits ONE and ZERO.

OTS SB-483 $0.10

Office of Technical Services, Dept. of Commerce, Washington, D. C.
LEATHER, HIDES, AND SHOES. Oct 61, 9p. 100 refs. OTS Selective Bibliography SB-483.

DESCRIPTORS: *Leather, *Fur, *Shoes, *Bibliography.

Lists 100 foreign and domestic references on leather, hides, and shoes added to the OTS collection during the period 1950 to October 1961. Covers research on water resistant leathers; leather fungicides and finishing; treatment of hides; tanning agents; moisture penetration tests on shoes, etc.

Ceramics and Refractories

ATL-A-121 $2.60

Advanced Technology Labs., Mountain View, Calif.
DEVELOPMENT OF CLAD CERAMIC FUEL PLATES BY SPRAY-COATING TECHNIQUES. Quarterly technical progress rept. Apr-June 61, on Contract AT(04-3)-250. 13p.

TID-3560 $3.00

Atomic Energy Commission, Div. of Technical Information Extension, Oak Ridge, Tenn.
REFRACTORY MATERIALS. A literature search. Nov 61, 232p.

GEMP-6A $0.50

General Electric Co., Cincinnati, Ohio.
HIGH TEMPERATURE MATERIALS PROGRAM. Progress rept. no. 6, part A, on Contract AT(50-1)-2847. Dec 61, 16p.

ORO-502 $2.60

United Nuclear Corp., Hematite, Mo.
CHARACTERIZATION OF UO_2 POWDERS, by James F. Carpenter and Carl W. Kuhlman. Quarterly rept. no. 2, 10 Jan-10 Apr 61, on Contract AT(40-1)-2699. Nov 61, 26p.

Fuels, Lubricants, and Hydraulic Fluids

PB 156 824 $1.60

Bureau of Mines, Pittsburgh, Pa.
IGNITION BY HOT GASES, by N. Vanpee and H. G. Wolfhard, Rept. on Contract Nonr-1858(25). Aug 60, 15p. 16 refs. Proj. Squid Technical rept. BUM-30-R; AD-244 954.

DESCRIPTORS: *Gases, *Ignition, *Explosive gases, Jets, Temperature, Mixtures, Methanes.

Studies were made of the ignition of explosive gaseous mixtures by the injection of jets of hot gases. The influence of jets of different diameter on ignition temperature was examined. Results indicated that the order of hydrocarbons when arranged according to ignition temperatures does not change for jet diameters between 0.4 and 1.7 cm. The extreme difference between methane and H became less for large jet diameters because the diameter has little effect on the ignition temperature of H. Temperature profiles were studied of the jets as they changed with distance. Ignition temperatures at the base of the jet were measured for ethane, propane, ethylene, propylene, and CO. Ignition was observed both with an undisturbed jet and when an H_2O- cooled plate intercepted the jet at successive intervals from the furnace unit. These observations permitted the calculation of activation energies of fuel-air mixtures from the change of ignition temperature with contact time. Methane ignition, contrary to other fuels, occurred at appreciably higher temperatures. A study was also made of ignition by hot burned gases. This ignition was very similar to that produced by hot inert gases with the exception of the turbulence occurring from separate eddies with the burned gases.

AD-262 989 repriced $2.50

Bureau of Mines, Pittsburgh, Pa.
REVIEW OF FIRE AND EXPLOSION HAZARDS OF FLIGHT VEHICLE COMBUSTIBLES, by Robert W. Van Dolah, Michael G. Zabetakis and others. Annual rept. for Apr 60-Apr 61 on Contract AF 33(616)60-8. Oct 61, 106p. 29 refs. ASD Technical rept. 61-278.

DESCRIPTORS: Fuels, *Aviation fuels, *Rocket propellants, *Rocket oxidizers, Vapor pressure, Combustion, Oxidation, Detonation, Ignition, Theory, Data, Rocket fuels, Liquid rocket propellants, Jet engine fuels, *Hazards, Fires, Aircraft fires, Explosions.

Vapor pressure data are presented for fluorine, oxygen, chlorine trifluoride, nitrogen tetroxide, nitric acid, hydrogen peroxide, ethylene oxide, hydrogen, ammonia, pentaborane, unsymmetrical dimethylhydrazine, monomethylhydrazine, hydrazine and a series of hydrocarbons including decalin, tetralin, bicyclohexyl and other high density fuels. In addition, flammability characteristics diagrams are included for each of these fuels in contact with air and where available, for other oxidants (e.g. oxygen and nitrogen tetroxide). Also included are sections on definitions and theory and applications. Each section is complete in itself and can be used separately. (Author)

Plastics

PB 159 231-1 $2.60

Aeronautical Materials Lab., Naval Air Material Center, Philadelphia, Pa.
DEVELOPMENT AND FORMULATION OF EXPERIMENTAL DIISOCYANATE-BASED LAMINATING RESINS, by S. Polis. Progress rept. 1 June-31 Dec 55, on TED Proj. NAM AE 4420. 2 Mar 56, 30p. 18 refs. Rept. no. NAMC-AML-AE-4420, part I.

DESCRIPTORS: Isocyanates, Cyanates, Laminates, *Resins, Synthesis, Tests

Progress on attempts to synthesize experimental laminating resins based on diisocyanates is reported. The basic chemistry of the two types of experimental resins is given. Test results reveal that experimental laminates meet some of the flexure requirements of Specification MIL-R-7575 (for polyester resins) and Specification MIL-R-9300 (for epoxy resins). Since the results are promising, investigation of experimental laminating resins based on diisocyanates will be continued in an attempt to achieve superior strength properties in laminates.

PB 159 231-2 $1.60

Aeronautical Materials Lab., Naval Air Material Center, Philadelphia, Pa.
DEVELOPMENT AND FORMULATION OF EXPERIMENTAL DIISOCYANATE-BASED LAMINATING RESINS, by L. C. Ritter and A. P. Bonnani. Progress rept. on BUAER Proj. TED NAM AE 4420. 16 Oct 58, 19p. 7 refs. Rept. no. NAMC AML AE 1071.

DESCRIPTORS: Isocyanates, Cyanates, Laminates, *Resins, Synthesis, Urethanes, Laminated glass, Tests

The successful synthesis of experimental solvent-type polyurethane laminating resins is reported. The test results reveal that the resins can be used to prepare glass laminates having flexural values that exceed the values required by specifications governing polyester, epoxy and phenolic laminating resins. A continuation of the development work is recommended based on the need for formulating resins possessing better thermal properties and for the determination of additional mechanical properties. (Author)

MATHEMATICS

ANL-6456 $2.00

Argonne National Lab., Ill.
ELEMENTARY DIVISORS AND SOME PROPERTIES OF THE LYAPUNOV MAPPING $X \longrightarrow AX + XA^*$, by Wallace Givens. Rept. on Contract W-31-109-eng-38. Nov 61, 80p.

PB 156 236 $2.60

Electronic Systems Lab., Mass. Inst. of Tech., Cambridge.
THE SEQUENTIAL TRANSMISSION EXPRESSION FOR FLOW GRAPHS, by D. R. Haring. Rept. on Contract AF 33(616) 5477. Nov 60, 29p. 6 refs. Technical memo. no. 7849-TM-3; AD-252 496.

DESCRIPTORS: *Statistical analysis, Electronic circuits.

The sequential transmission of a flow graph is the transmission function that preserves the order of the branches that are traversed in passing from the source node of the transmission to its sink node. This memorandum presents and proves the validity of an inspection procedure that can be used to write the sequential transmission of a linear flow graph in which the branches represent noncommutative operators. As an example, the regular expression that represents the sequence of events carrying a finite automata from one state to another is written using this procedure. (Author)

PB 158 655 $1.60

Florida State U., Tallahassee.
THE ASYMPTOTIC PROPERTIES OF ML ESTIMATORS WHEN SAMPLING FROM ASSOCIATED POPULATIONS, by Ralph A. Bradley and John J. Gart. Technical rept. no. 1, on The Development of Statistical Methods for Quality Control and Surveillance Testing Subjective Testing and Quality Evaluation, Contract Nonr-988(08). Dec 60, 18p. 17 refs. AD-251 489.

DESCRIPTORS: *Statistical analysis, *Sampling, Population

The basic theory on ML estimation is extended to associated populations. Under regularity conditions developed, the ML estimators for parameters in associated populations are shown to be consistent and asymptotically normal with a variance-covariance matrix as derived. Consideration was limited to ML estimators that are roots of the normal equations for the maximization process. The consistency of the more generally defined estimator can be proved for associated populations following the approach of Wald (Trans. Amer. Math. Soc. 54:426-82, 1943). The demonstrations follow those of Chanda (Biometrika 41:56-61, 1954) closely; most of the results for associated populations are easy generalizations of results for a single population and results are stated without complete proofs when this is so. Two simple examples involving associated populations are included. (Author)

PB 154 741 $12.00

Institute of Statistics, U. of North Carolina, Chapel Hill.
ASYMPTOTIC METHODS OF EVALUATING $\int_a^{\infty} f(x)dx$, by Wyman Richardson. Rept. on Contract Nonr-855(06). May 60, 170p. 59 refs. Mimeograph Series no. 257; AD-250 451.

DESCRIPTORS: *Statistical processes, *Integrals, Distribution, Probability.

Methods for evaluating an integral from some point, a, to infinity, of a known function, f, are given. The methods considered lead to approximations that get increasingly accurate as a approaches infinity, so they are especially applicable to the tail of a distribution. The methods can be applied to the usual levels of untabulated distributions and to extreme levels of the common distributions.

PB 158 567 $2.60

Institute of Statistics, U. of North Carolina, Chapel Hill.
CENTRAL LIMIT THEOREM AND CONSISTENCY IN LINEAR REGRESSION, by Friedhelm Eicker. Rept. on Contract Nonr-855(06). Dec 60, 27p. 6 refs. Mimeograph series no. 271; AD-248 660.

DESCRIPTORS: *Sampling, *Matrix algebra, Least squares method, Errors.

Several asymptotic properties of the least squares estimators for the parameters in the linear regression model with non-identical, independent errors are derived with regard to infinitely increasing sample size. The notion of convergence of a sequence of random variables b on a set F is introduced and applied, i.e., the b depend functionally on an arbitrarily chosen sequence of random variables all of which are elements of the set F, and they converge for each such sequence. If F is any set of random variables with zero means and bounded variances which contains at least one normal variable, then there exists a simple necessary and sufficient condition for the regression matrix X such that the estimators are consistent on F. For asymptotic normality of essentially these estimators on any subset G in the set of all zero-mean random variables whose variances exist, necessary and sufficient conditions are given both for X and the set G simultaneously to be fulfilled. This is the central limit theorem for the linear regression model. For the case of unknown error variances, a statistic is constructed, and sufficient conditions for X and G are

given to assure its asymptotic normality on G. One important aspect of the theory developed is its nonparametric character and the width of the range of admitted error distributions. Some examples and illustrations are given. (Author)

PB 157 414 $1.10

Institute of Statistics, U. of North Carolina, Chapel Hill.
A NECESSARY AND SUFFICIENT CONDITION FOR CONSISTENCY OF THE LS-ESTIMATES IN LINEAR REGRESSION, by Friedhelm Eicker. Rept. on Contract Nonr-855(06). Oct 60, 9p. 1 ref. Mimeograph Series no. 266; AD-250 003.

DESCRIPTORS: *Least squares method, *Statistical data, Difference equations, Vector analysis.

PB 157 415 $8.10

Institute of Statistics, U. of North Carolina, Chapel Hill.
ON SOME GENERAL RENEWAL THEOREMS FOR NONIDENTICALLY DISTRIBUTED VARIABLES, by Walter L. Smith. Rept. on Contract Nonr-855(09). Oct 60, 82p. 13 refs. Mimeograph Series no. 267; AD-250 004.

DESCRIPTORS: *Sequential analysis, Theory, *Statistical processes, Statistical functions, Probability, Functions.

Order from GPO $0.40 as C 13.32:58

National Bureau of Standards, Washington, D. C.
FRACTIONAL FACTORIAL DESIGNS FOR EXPERIMENTS WITH FACTORS AT TWO AND THREE LEVELS, by W. S. Connor and Shirley Young. 1 Sep 61, 65p. Applied Mathematics Series 58.

DESCRIPTORS: *Combinatorial analysis, Mathematics.

The designs presented in this publication are for experiments with some factors at two levels and other factors at three levels. The designs are constructed so that the grand mean, all main effects, and all two-factor interaction effects can be estimated without aliasing among them. It is assumed that all higher-order interaction effects are negligible, and their absence makes it possible to estimate the error variance.

Computing Devices

Order from GPO $1.25 as D 1.31:961

Department of Defense, Washington, D. C.
COBOL, REPORT TO CONFERENCE ON DATA SYSTEMS LANGUAGES INCLUDING REVISED SPECIFICATIONS FOR A COMMON BUSINESS ORIENTED LANGUAGE (COBOL) FOR PROGRAMMING ELECTRONIC DIGITAL COMPUTERS. Technical reference manual. 1961, 245p.

DESCRIPTORS: *Digital computers, Computers, *Programming, *Language, Specifications, Conferences.

This report represents the results of a year of use and experience following the publication of the April 1960 report, "COBOL - Initial Specifications for a Common Business Oriented Language (COBOL) for programming electronic digital computers." This revision and up-COBOL has been prepared by a Special Task Group representing both users and manufacturers of data processing equipment. The Executive Committee of the Conference On Data Systems Languages (CODASYL) recommends that users of general purpose digital computers use COBOL and share the results of their experience through the Conference so that progress will continue to be made toward the goal of developing a common programming language, basically in English, which is oriented toward business data processing problems, open-ended, and independent of any make or model of data processing equipment.

PB 156 233 $10.10

Electronic Systems Lab., Mass. Inst. of Tech., Cambridge.
ANALYSIS AND SIMULATION OF INCREMENTAL COMPUTATIONS PERFORMED BY BINARY RATE MULTIPLIERS, by Donald R. Haring. Rept. on Contract AF 33(616)5477. Apr 60, rev. 2 Aug 60, 125p. 20 refs. Rept. 7849-R-10, includes Memo. rept. no. 7849-M-372; AD-240 312; AD-242 246.

DESCRIPTORS: *Digital computers, Computers, Electronic circuits, Circuits, *Electronic equipment, *Electronic integrators, Mathematical analysis, Errors, Simulation, Analysis.

The Binary Rate Multiplier (BRM) is a particularly interesting building block for special-purpose digital computer applications because of its simplicity. To date, the mathematical model used to describe the operation of the BRM has been based on the pulse-rate multiplication. This model is not very satisfactory for general analysis and synthesis of systems, because this model only describes the average behavior of the BRM, and fails to provide an accurate description of the instantaneous operation of the BRM. In this report, the usual rate-multiplier model is replaced by an incremental mathematical model for the BRM. Using this incremental model, it is shown that the BRM, in conjunction with a binary counter, can be treated as an incremental integrator which performs the rectangular approximation to an integral, and that its operation differs from other such integrators only in its round-off error. The characteristics of the BRM integrator round-off error are derived, with emphasis on the effects of scaling, register length, and constraints on increment magnitude. To complete the study of the BRM, several examples of BRM calculations are analyzed on the incremental basis, and the results obtained from simulation of the BRM on a digital computer are discussed. (Author)

PB 156 237 $3.60

Electronic Systems Lab., Mass. Inst. of Tech., Cambridge.
DECISION MAKING STUDIES VIA WHIRLWIND COMPUTER MODELS, by Richard S. Marcus and John F. Walsh. Rept. for Aug 58-May 59, on Contract AF 33(616)5477. Aug 60, 52p. 3 refs. Technical memo. no. 7849-TM-5; AD-247 434.

DESCRIPTORS: *Digital computers, *Programming, Warfare, Simulation, Statistical analysis, *Games theory, *Military operations.

The formulation of satisfactory strategies is investigated for complicated game-like situations such as a bomber defending itself against enemy attacks. The difficulties of a game theory solution led to the approach of finding a satisfactory strategy (not necessarily optimum) by suitable trial and error procedures on a computer simulated model that is detailed enough to reflect the real situations adequately but that need not be in any specified mathematical form. Computer experiments on a simple decision-making problem indicate that this approach is sound and suggest that techniques of computer utilization can be important for efficient problem solution. These experiments and techniques are described. (Author)

KAPL-M-EC-12 $5.60

Knolls Atomic Power Lab., Schenectady, N. Y.
CURFIT: CURVE FITTING PROGRAM, by James A. Warrington. Rept. on Contract W-31-109-eng-52. Sep 61, 51p.

PB 155 829 $1.60

Naval Air Development Center, Johnsville, Pa.
SYNCHRO SHAFT POSITION ENCODERS, by J. Wullert. Rept. on TED Proj. ADC-AE-7055. 15 Oct 57, 20p. 3 refs. Rept. no. NADC-ED-5718.

Portions of this report will not reproduce well.

DESCRIPTORS: *Digital computers, Reduction, Excitation, *Pulse generators, *Time interval counters, Electronic equipment, Computers, Synchros, *Coding

This report describes two methods of transforming the position of a synchro shaft into a binary number which is acceptable to a general-purpose digital computer. The conversion methods detailed are outgrowths of the basic synchro shaft position-to-digital encoder. The synchro shaft position encoders types I and II described in this report reduce the maximum encoding time from two cycles of the excitation voltage frequency to one cycle and one-half cycle respectively. This reduction in encoding time is made possible by generating two pulses which are accurately spaced 180 degrees apart for each cycle of the excitation voltage frequency. (Author)

PB 154 196 $1.60

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
SOME RECENT SIMPLIFICATIONS OF THE THEORY OF FINITE AUTOMATA, by Richard C. Jeffrey. Rept. on Contract DA 36-039-sc-78108. 27 May 59, 14p. 5 refs. Technical rept. 219; AD-218 936.

DESCRIPTORS: *Digital computers, Computers, Computer logic, *Cybernetics, Metamathematics, Theory.

Automata are defined as four-termed relations (sets of quadruples). Reduced automata, that is, automata in which the states serve as output symbols, are defined as three-termed relations (sets of triples). A method is given for replacing the nodes and arrows in the graphs of such relations by neurons or by other logical elements in such a way that the resulting net realizes the corresponding automaton. This method is applicable whether or not the relation corresponds to a single-valued function; that is, whether or not the next state of the automaton is uniquely determined by the present state and input symbol. Kleene's theory of the representation of events (sets of input words) by finite automata is presented in a simplified and strengthened form largely due to Medvedev, Nerode, and Rabin and Scott. It is also proved that a set which does not contain the "word" of length zero is representable by a reduced finite automaton if and only if it is representable by a nonreduced finite automaton. (Author)

MECHANICS

PB 159 207-1 $4.60

[Institute of Science and Tech.] U. of Michigan, Ann Arbor.
REDUCTION OF THE RESPONSE TO VIBRATION OF STRUCTURES PROCESSING FINITE MECHANICAL IMPEDANCE, PART I, by J. C. Snowdon. Rept. on Contract NObs-77072, Nov 59, 43p. 11 refs. 2892-4-T.

DESCRIPTORS: *Machines, *Vibration isolators, Rubber, Synthetic rubber, Mechanical properties, Impedance, Damping, Vibration.

The dynamic mechanical properties possessed by rubber-like materials have been reviewed. The value of a mounting composed of natural rubber and a high damping rubber in parallel has in this way been made apparent. The performance of the so-called parallel mounting system supported by a foundation possessing finite mechanical impedance has been theoretically determined. A simply supported damped beam has been employed to simulate the behavior of the non-rigid foundation. It has been shown that the parallel mounting can provide superior over-all isolation to either a natural rubber mount or a high damping mount at frequencies below two or three hundred cycles per second. It has also been shown that as the ratio of the mass of the mounted item to the mass of the foundation increases, the isolation afforded by the mounting becomes smaller and departs further from the isolation obtained when the foundation is completely rigid. The damping of the foundation has only secondary influence upon the over-all level of the isolation afforded by the mounting system.

PB 159 207-2 $5.60

[Institute of Science and Tech.] U. of Michigan, Ann Arbor.
REDUCTION OF THE RESPONSE TO VIBRATION OF STRUCTURES POSSESSING FINITE MECHANICAL IMPEDANCE, PART II, by J. C. Snowdon. Rept. on Contract NObs-77072. Jan 60, 52p. 5 refs. 2892-6-T.

DESCRIPTORS: *Machines, *Vibration isolators, Rubber, Synthetic rubber, Mechanical properties, Impedance, Damping, Vibration, Load distribution.

The performance of simple and compound mounting systems supported by a foundation of finite mechanical

impedance, and the performance of the simple mounting supported by a mass-loaded foundation, have been theoretically determined and compared. A simply supported damped beam has been employed to simulate the behavior of the foundation. The dynamic mechanical properties of natural rubber and a high-damping rubber have been employed to describe the behavior of anti-vibration mount materials. When the ratio of the mass of the mounted item to the mass of the foundation is large, the isolation afforded by the simple mounting is much less than perdicted by its transmissibility curve, which relates to an ideally rigid foundation. The isolation provided by the simple mounting is increased significantly at high frequencies when the foundation of the mounting system is mass-loaded, being largest for a natural rubber mounting. In the example considered, large, but not greater, isolation is provided at high frequencies by the compound mounting utilizing a secondary mass equal to this loading mass, and mountings composed of natural and high-damping rubber in parallel.

Aerodynamics and Pneumatics

PB 157 807 $2.60

Mississippi State U., State College.
IBM 650 PROGRAMS FOR DETERMINING POTENTIAL PRESSURE DISTRIBUTION AND MOMENT COEFFICIENT OF AN ARBITRARY AIRFOIL, by Lucy P. Inkster and Virginia S. Jones. Research note no. 11, on Contract Nonr-978(01). 1 Oct 60, 26p. 3 refs. AD-246 392.

DESCRIPTORS: *Pressure, Distribution, Moments, *Airfoils, Digital computers, Programming, Fourier analysis, Computers.

Contents:
Program for determining pressure distribution: Introduction; The first phase of program; The second phase of program; The third phase of program; Airfoil data; Input cards, Output cards; Program for determining moment coefficient: Input cards; Output cards; Operator instructions: Board wiring; Switch control; Program for determining pressure distribution; Fourier analysis, Fourier synthesis and pressure distribution; Pressure distribution; Fourier analysis only; Fourier analysis and Fourier synthesis; Fourier analysis and pressure distribution; Fourier synthesis only; Pressure distribution only; Fourier synthesis and pressure distribution; Program for determining moment coefficient.

AD-263 032 $3.60 Not announced by ASTIA

National Research Labs., Ottawa (Canada).
AN APPROXIMATE THEORY OF EQUILIBRIUM ONE-DIMENSIONAL STEADY AND UNSTEADY EXPANDING FLOWS OF AN IDEAL DISSOCIATING GAS, by R. J. Stalker. June 61, 40p. 1 ref. Mechanical engineering rept. MT-45; NRC no. 6426.

DESCRIPTORS: *Gas flow, Gases, Fluid mechanics, *Dissociation, *Thermodynamics, Nozzles, Low temperature research.

An analysis has been undertaken of the one-dimensional flow of an ideal dissociating gas in a nozzle, and in unsteady expansion in a constant area tube. Approximate expressions, based on a low temperature assumption, have been derived to predict, in the former case, the variation of dissociation fraction and pressure with area ratio, and in the latter case, the association between pressure, dissociation fraction, and velocity. For the nozzle, expressions are also obtained, without using the low temperature approximation, which enable flow quantities to be calculated at stations sufficiently far down-stream for recombination to be complete. (Author)

AD-265 559 repriced $0.50

Naval Ordnance Lab., White Oak, Md.
THE DEVELOPMENT OF AN EXPLOSIVE HIGH-PRESSURE RELEASE, by Rayner A. Montgomery and E. Eugene Kilmer. 1 Aug 61, 20p. 1 ref. Ballistic research rept. no. 37; NAVWEPS 7327.

DESCRIPTORS: *Explosives, *Sheets, *Diaphragms (Mechanics), Shock tubes, Gases, Pressure, *Hypersonic flow, Tests, Shock waves, High speed photography, Re-entry aerodynamics, Test facilities.

An experimental investigation was conducted to determine the feasibility of using explosives as a diaphragm for sudden release of high-pressure gas. From the tests, it appears that the use of a sheet explosive as an explosive membrane will satisfy the conditions of extremely fast action (in the order of microsec), absence of solid fragments, and a complete opening allowing unrestricted gas flow. Diaphragms of 1.5-in. diam were tested by releasing gas pressures up to 750 psi. Although the contemplated use is that of a muzzle diaphragm to release the working gas in a hypersonic shock tunnel, this type of pressure release may be adaptable to other applications. (Author)

Hydrodynamics, Hydraulics, and Hydrostatics

PB 158 050 $2.60

Davidson Lab., Stevens Inst. of Tech., Hoboken, N. J.
FORCE AND MOMENT CHARACTERISTICS OF A SURFACE-PIERCING, FULLY VENTILATED, DIHEDRAL HYDROFOIL, by Gerard Fridsma. Rept. on Contract Nonr-263(20). Nov 60, 25p. 5 refs. Rept. no. 795; AD-247 326.

DESCRIPTORS: *Hydrofoils, *Hydrodynamics, Model tests, Tests, Moments.

An experimental investigation was conducted on a surface-piercing, fully ventilated hydrofoil to determine its force and moment characteristics. A 30-degree, dihedral foil was tested at a constant speed of 20 fps, at trim angles of 3 to 20 degrees, and at submergences of 1 to 3 chords. The results obtained are in good agreement with the theoretical predictions and confirm the force equations developed for a flat foil with zero sweep, taper, and twist. The positions of the sectional center-of-pressure on the foil was assumed to be the theoretical value derived for a two-dimensional, ventilated, flat plate. This assumption was experimentally verified to be correct for the hydrofoil tested. The existence of a minimum angle (4 degrees), below which a fully ventilated flow could

not be maintained, was confirmed. This occurred at a lift coefficient of 0.10. In addition, to describing the force and moment characteristics of the foil, these measurements can be also used to predict the hydrofoil force and moment derivatives, which are essential when dealing with stability problems. Future development will be concerned with comparing these derivatives with those obtained from dynamic free oscillation tests on the same hydrofoil. (Author)

PB 157 383 $3.60

Davidson Lab., Stevens Inst. of Tech., Hoboken, N. J.
GUIDE TO COMPUTATIONAL PROCEDURE FOR ANALYTICAL EVALUATION OF SHIP BENDING-MOMENTS IN REGULAR WAVES, by W. R. Jacobs, J. Dalzell, and P. Lalangas. Rept. on Contract Nonr-263(10). Oct 60, 35p. 8 refs. Rept. no. 791; AD-246 138.

DESCRIPTORS: *Hydrodynamics, Ships, Stresses, *Marine engineering, *Water waves, Sea water, Motion, Moments.

A step-by-step guide to computational procedure is presented for the use of a theoretical method, developed (Korvin-Kroukovsky, Trans. SNAME 1955, 1957) to calculate the forces that act on a ship in regular headseas and result in heaving and pitching motions and longitudinal bending-moments. The tables are devised to implement the linearized theory based on the assumption that wave heights and motions are small enough so that the coefficients of the equations of motion may be considered as constant in time. All dimensions and hydrodynamic coefficients are for the part of the hull below the still-water level. The analytically calculated motions and bending-moments therefore vary linearly with wave height. (Author)

HW-65722(Rev) $1.25

Hanford Atomic Products Operation, Richland, Wash.
THE THERMAL HYDRAULICS LABORATORY AT HANFORD, by J. M. Batch, K. G. Toyoda and H. E. Hanthorn. Rept. on Contract AT(45-1)-1350. Nov 61, 53p.

ORNL-TM-52 $2.60

Oak Ridge National Lab., Tenn.
HYDRODYNAMIC TESTS OF CYLINDRICAL HRE-2 REPLACEMENT CORE MODEL, by W. R. Mixon and C. G. Lawson. Sep 61, 26p.

METALLURGY

ANL-6412 $0.75

Argonne National Lab., Ill.
SOME METALLURGICAL APPLICATIONS OF AUTORADIOGRAPHY, by Max D. Adams and Robert K. Steunenberg. Rept. on Contract W-31-109-eng-38. Oct 61, 32p.

NAA-SR-6431 $1.00

Atomics International, Canoga Park, Calif.
FABRICATION AND WELDING CHARACTERISTICS OF HIGH STRENGTH ZIRCONIUM ALLOY 3Z1, by R. K. Wagner. Rept. on Contract AT(11-1)-GEN-8. Dec 61, 50p.

NAA-SR-6213 $0.50

Atomics International, Canoga Park, Calif.
FABRICATION DEVELOPMENT OF APM ALLOYS FOR FUEL ELEMENTS, by E. G. Kendall, G. V. Alm and others. Rept. on Contract AT(11-1)-GEN-8. Dec 61, 23p.

NAA-SR-6617 $0.50

Atomics International, Canoga Park, Calif.
THE GAMMA TO GAMMA PRIME TRANSFORMATION IN THE URANIUM-MOLYBDENUM SYSTEM, by D. Kramer and C. G. Rhodes. Rept. on Contract AT(11-1)-GEN-8. Dec 61, 23p.

NAA-SR-6125 $0.50

Atomics International, Canoga Park, Calif.
ISOTHERMAL TRANSFORMATION OF U - 14 AND U - 16 WT % Mo ALLOYS AT 550°C, by W. A. Holland. Interim rept. on Contract AT(11-1)-GEN-8. Dec 61, 17p.

SEP-256 $0.75

Bayside Labs., General Telephone and Electronics Labs., Inc., N. Y.
FUNDAMENTALS OF DIFFUSIONAL BONDING V, by L. S. Castleman, H. A. Froot, and L. Seigle. Annual progress rept. 1 July 59-30 June 60, on Contract AT(30-1)-2102. 29p.

SEP-258 $0.75

Bayside Labs., General Telephone and Electronics Labs., Inc., New York.
FUNDAMENTALS OF DIFFUSIONAL BONDING - VI, by L. S. Castleman, H. A. Froot and L. Seigle. Annual progress rept. 1 July 60-30 June 61, on Contract AT(30-1)-2102. July 61, 35p.

TID-13496 $5.60

Case Inst. of Tech., Cleveland, Ohio.
TRANSFORMATION CHARACTERISTICS OF ZIRCONIUM-NIOBIUM ALLOYS, by D. J. Cometto, G. L. Houze, Jr. and R. F. Hehemann. Interim technical rept. no. 4 on Contract AT(11-1)-588. July 61, 54p.

TID-13495 $8.60

Illinois U., Urbana.
DIFFUSIONLESS PHASE CHANGES IN NON-FERROUS METALS AND ALLOYS, by T. A. Read, D. S. Lieberman and others. Technical progress rept. 1 July 60-31 July 61, on Contract AT(11-1)-67. Aug 61, 95p. MEDUI-7-AEC.

AD-258 621 repriced $1.75

Illinois U. Engineering Experiment Station, Urbana.
INELASTIC DESIGN OF LOAD CARRYING MEMBERS. PART IV. THE BEHAVIOR OF BEAM-COLUMNS IN THE INELASTIC RANGE, by B. B. Muvdi and O. M. Sidebottom. Rept. for 1 Oct 60-31 Sep 61, on Metallic Materials, Contract AF 33(616)7600. July 61, 68p. 22 refs. [T&AM rept. no. 183] WADD Technical rept. 60-580 pt. 4.

DESCRIPTORS: *Beams, Design, Theory, Moments, Load distribution, Stresses, Deformation, Deflection, Elasticity, Aluminum alloys, Stainless steel, Steel, Buckling, Mathematical analysis, Tests, Structures, Mechanics, Failure (Mechanics), Materials.

Two theories were presented for constructing either moment-load or load-deflection relations as well as the collapse loads for beam-columns. In each case, trial and error solutions were required which used constant depth of yielding interaction curves. A so-called exact theory was presented which gave results as accurate as desired however, the theory was not practical because of the excessive time required. An approximate theory was presented which gave results in close agreement with the exact theory and with experimental data. This theory required the elastic solution for maximum elastic conditions. The experimental part of the investigation included tests of rectangular - and T-section columns made of 2024-T4 aluminum alloy, SAE 1020 steel, and 17-7PH stainless steel. Several slenderness ratios were considered. In addition to the variable axial load, the columns were subjected to a constant transverse load either at midspan or at quarter span. (Author)

KAPL-2173 $0.50

Knolls Atomic Power Lab., Schenectady, N. Y.
A MICROPYCNOMETER FOR MEASURING DENSITIES OF POWDERED MATERIALS, by J. R. Fascia and W. V. Johnston. Rept. on Contract W-31-109-eng-52.

LA-2591 $1.25

Los Alamos Scientific Lab., N. Mex.
FABRICATION OF TANTALUM CAPSULES BY IMPACT EXTRUSION AND IRONING, by R. S. Kirby, G. S. Hanks, and J. M. Taub. Rept. on Contract W-7405-eng-36. Dec 61, 56p.

AD-262 588 $3.60

Materials Research Lab., Watertown Arsenal, Mass.
THE CONTRIBUTION OF STRAIN TO NUCLEAR QUADRUPOLE INTERACTIONS IN DILUTE ALLOYS OF COPPER, by Paul L. Sagalyn, Arthur Paskin, and Ralph J. Harrison. Mar 61, 33p. 26 refs. MRL rept. no. 96.

DESCRIPTORS: *Alloys, *Copper alloys, *Quadrupole moments, *Nuclear magnetic resonance, Stresses, Chemical impurities, Impurities, Electric fields, Valence.

The hypothesis that electric field gradients due to elastic strains (size effect) about the solute atom in dilute alloys of a cubic metal form an important part of the total field gradient at the solvent nuclei is developed quantitatively. Results have been applied to a consideration of recent NMR experiments by Rowland on dilute copper alloys which were interpreted by him and by Kohn and Vosko in terms of the spatially oscillating charge due to conduction electron redistribution (valence effect.) The good agreement with theory they obtained is further improved to a significant degree by the simultaneous consideration of both size effect and valence effect. It is found that the field gradients due to size effect are in fact comparable in magnitude to those due to the valence effect. The magnitude of the size effect is described by a single parameter characteristic of the solvent. It is found that the value of this parameter obtained for copper metal is larger than that indicated by recent experiments by Faulkner and by Averbuch, de Bergevin and Muller-Warmuth, and possible causes of this disagreement are discussed. (Author)

PB 156 853 $4.60

Naval Engineering Experiment Station, Annapolis, Md.
CORROSION AND MECHANICAL PROPERTIES OF TITANIUM AND ZIRCONIUM AT NORMAL TEMPERATURES, by W. Lee Williams. [1951] 45p. 10 refs. E.E.S. rept. C-3395-B, C-3501-C.

DESCRIPTORS: *Titanium, *Zirconium, Titanium alloys, Corrosion, Mechanical properties, *Corrosion research.

The Ti and Zr materials investigated represent metal consolidated by powder metallurgy and by several melting processes. These in turn reflect various impurity levels, especially of the C. The chemical compositions and tensile properties are reported. Corrosion tests are included for long exposure periods in a marine atmosphere and in quiet sea water (fouling conditions). Other corrosion tests include those in slowly moving sea water for Ti with and without coupling to various other metals. Data are presented concerning the resistance of Ti to hydraulic cavitation resistance. Further fatigue tests are reported on notched and unnotched specimens. Of particular interest is the discovery that the resistance to salt-water corrosion fatigue is very nearly equal to the fatigue strength in air; the salt-water corrosion-fatigue properties seem to be superior to those for any other known structural alloy.

DP-581 $2.00

Savannah River Lab., Aiken, S. C.
MECHANICAL PROPERTIES OF IRRADIATED PLAIN CARBON AND ALLOY STEELS, by R. E. Schreiber. A compilation of the data in the literature. Rept. on Contract AT(07-2)-1. Oct 61, 82p.

NDA-2119-1 $0.75

United Nuclear Corp., White Plains, N. Y.
THE PREPARATION AND PROPERTIES OF DISPERSION-HARDENED URANIUM POWDER PRODUCTS, by W. Arbiter. Rept. on Contract AT(30-1)-2303. Feb 61, 33p.

Ferrous Metals

NYO-9725 $3.00

Arcos Corp., Philadelphia, Pa.
ELECTRODES FOR WELDING TYPE 347 STAINLESS STEEL, by T. J. Moore and R. B. Gunia. Summary rept. on Contract AT(30-1)-1233. July 61, 221p.

HW-68608 $1.10

Hanford Atomic Products Operation, Richland, Wash.
TRIP REPORT. STATUS OF 17-4 PH AND OTHER PRECIPITATION HARDENING STAINLESS STEELS, by S. H. Bush. Feb 61, 9p.

SCDR-38-61 $1.60

Sandia Corp., Livermore, Calif.
TENSILE TESTS ON 304 ELC STAINLESS STEEL, by J. D. Huntting. Nov 61, 11p.

DP-579 $2.25

Savannah River Lab., Aiken, S. C.
MECHANICAL PROPERTIES OF IRRADIATED STAINLESS STEELS, by R. E. Schreiber. A compilation of the data in the literature. Rept. on Contract AT(07-2)-1. Sep 61, 108p.

Structural Metallurgy and Corrosion

PB 158 631 $6.60

Hammond Metallurgical Lab., Yale U., New Haven, Conn.
A UNIFIED STRUCTURAL MECHANISM FOR INTERGRANULAR AND TRANSGRANULAR CORROSION CRACKING, by W. D. Robertson and A. S. Tetelman. Technical rept. no. 2, on Contract Nonr-609(28). Dec 60, 70p. 45 refs. AD-250 369.

DESCRIPTORS: *Metals, *Corrosion, Grains (Metallurgy), Fracture (Mechanics), Stresses, Copper alloys, Stainless steel.

A unified, structural mechanism is proposed to explain the phenomena of intergranular and transgranular stress corrosion cracking. The dependence of failure on composition and stress in copper alloys and in stainless steels is analyzed in terms of two general conditions: (1) a chemically reactive path and (2) a mechanism of concentrating stress across the reactive path.

KAPL-M-BED-4 $1.60

Knolls Atomic Power Lab., Schenectady, N. Y.
THE CORROSION BEHAVIOR OF HAFNIUM AND HAFNIUM ALLOYS IN HIGH TEMPERATURE WATER AND STEAM, by B. E. Dearing and A. M. Andrako. Rept. on Contract W-31-109-eng-52. Aug 61, 17p.

AD-263 095 $1.60

Materials Research Lab., Watertown Arsenal, Mass.
A SURVEY OF PROCEDURES FOR METALLOGRAPHIC SPECIMEN PREPARATION, by M. R. Norton. Mar 61, 18p. 52 refs.

DESCRIPTORS: *Metallurgical analysis, *Symposia, Microscopy, Materials, Metals, Alloys, Surfaces, Preparation, Abrasives, Electrolytic polishing, Microtomes, Test methods, Microstructure, Surface properties.

The historical development of procedures for metallographic specimen preparation is reviewed. It is pointed out that mechanical methods of polishing have undergone practically no basic change from their inception to the present time. Progress in the determination of the effect of mechanical polishing on specimen structure is discussed briefly. Reference is made to procedures, other than mechanical, for specimen preparation.

AD-262 587 $1.60

Materials Research Lab., Watertown Arsenal, Mass.
A THEORETICAL STUDY OF RADIATION DAMAGE AND LATTICE DEFECTS IN METALS, by J. B. Gibson, G. H. Vineyard and others. Mar 61, 18p. 6 refs. MRL rept. no. 92.

DESCRIPTORS: *Metals, *Radiation damage, Lattices, Deformation, Theory, Crystals, Crystal structure, Copper, *Mathematical analysis, Digital computers, Atoms, Motion, Atomic structure, Diffusion, Bombardment, Energy.

Radiation damage processes and static defect configurations in a model representing copper are studied with the aid of a high-speed computer. Threshold energies for displacement of atoms from lattice sites are found to depend upon lattice direction. Damage in the form of vacancies and interstitials has been observed as have focusing chains and defect annealing. The stability of interstitials, Frenkel pairs and crowdions also has been investigated by this method. (Author)

NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

TID-13073 $14.50

Case Inst. of Tech., Cleveland, Ohio.
NUCLEATION AND COPRECIPITATION FROM HOMOGENEOUS SOLUTION, by Louis Gordon, Kazuyoshi Takiyama and others. Annual progress rept. on Contract AT(11-1)-582. June 61, 223p.

CEND-146 $0.75

Combustion Engineering, Inc., Windsor, Conn.
AN EVALUATION OF EFFECTIVE PLUTONIUM CROSS SECTIONS IN REACTIVITY CALCULATIONS, by E. Fein and L. C. Noderer. Rept. on Contract AT(30-1)-2379. Sep 61, 32p.

NYO-9143 $1.50

Consolidation Coal Co., Library, Pa.
UTILIZATION OF RADIOACTIVE ISOTOPES IN COAL PROCESS RESEARCH, by P. M. Yavorsky and E. Gorin. Rept. on Contract AT(30-1)-2350. Apr 61, 56p.

TID-13922 $1.10

Michigan U., Ann Arbor.
NEUTRON-CAPTURE GAMMA-RAY SPECTRA OF THE BROMINE ISOTOPES, by P. A. Treado and P. R. Chagnon. 19p.

NAS-NS-3048 $0.50

Oak Ridge National Lab., Tenn.
THE RADIOCHEMISTRY OF POTASSIUM, by W. T. Mullins and G. W. Leddicotte. Nov 61, 45p.

TID-13118 $2.60

Pennsylvania State U., University Park.
EFFECT OF RADIATION ON DYNAMIC PROPERTIES OF HIGH POLYMERS, by J. A. Sauer. Progress rept. 1 July 60-30 June 61, on Contract AT(30-1)-1858. July 61, 25p.

Elementary Particles

UCRL-8030(Rev.) $0.75

Lawrence Radiation Lab., U. of California, Berkeley.
DATA FOR ELEMENTARY-PARTICLE PHYSICS, by Walter H. Barkas and Arthur H. Rosenfeld. Rept. on Contract W-7405-eng-48. Oct 61, 29p.

UCRL-5918-T $1.60

Lawrence Radiation Lab., U. of California, Livermore.
MONTE CARLO SCHEMES FOR NEUTRON MIGRATION USING IMPORTANCE SAMPLING AND SPLITTING, by E. L. Kaplan. 18p.

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Lawrence Radiation Lab., U. of California, Berkeley.
PION-HYPERON RESONANCES, by Stanley G. Wojcicki. Rept. on Contract W-7405-eng-48. Aug 61, 109p.

PB 158 253 $2.60

Weizmann Inst. of Science (Israel).
MESON PRODUCTION IN NUCLEUS-NUCLEUS COLLISIONS, by G. Alexander, J. Avidan and others. Technical note no. 2, on Contract AF 61(052)371. 15 Nov 60, 24p. 12 refs. AFCRL-407.

DESCRIPTORS: *Mesons, Production, Nuclei, *Nucleons, *Nuclear reactions, Particles, Scattering, Cosmic rays, Photographic emulsions.
Nucleus-nucleus collisions at cosmic ray energies are described by a simple geometrical model. The average multiplicity for different types of reactions is predicted and compared with experimental observation. (Author)

Instruments and Installations

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DISMANTLING ENCLOSURE FOR EXTERNAL CYCLOTRON TARGETS, by George L. Wigle, Neil C. Spencer and others. Rept. on Contract W-7405-eng-48. Sep 61, 10p.

ORINS-40 $1.50

Oak Ridge Inst. of Nuclear Studies, Tenn.
A HIGH MAGNETIC FIELD BUBBLE CHAMBER. Rept. of ORINS-ORNL study comm'ttee. Nov 61, 60p.

NP-10738 $0.50

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ANL-6473 $1.75

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REACTOR DEVELOPMENT PROGRAM. Progress rept. on Contract W-31-109-eng-38. Nov 61, 69p.

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Atomic Energy Commission. Div. of Technical Information Extension, Oak Ridge, Tenn.
PROCEEDINGS OF ANNUAL NUCLEAR MATERIALS MANAGEMENT MEETING, Denver, Colorado, June 1961, 131p.

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LIFETIME CHARACTERISTICS AND ECONOMICS OF SLIGHTLY ENRICHED URANIUM DIOXIDE IN WATER LATTICES, by J. Bengston, J. M. Ravets and R. J. Rickert. Final rept. on Study of Slightly-Enriched Uranium-Water Lattices with High Conversion Ratio, Contract AT(30-1)-2379. Sep 61, 53p.

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du Pont de Nemours, E. I., and Co., Wilmington, Del.
HEAVY WATER MODERATED POWER REACTORS, comp. by R. R. Hood and L. Isakoff. Progress rept. Oct 61, on Contract AT(07-2)-1. Nov 61, 36p.

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MARITIME GAS-COOLED REACTOR PROGRAM. TECHNICAL FEASIBILITY STUDIES OF FABRICATION TECHNIQUES APPLICABLE TO THE MANUFACTURE OF HIGH-DENSITY BERYLLIA TUBES FOR POTENTIAL UTILIZATION IN THE MARITIME GAS-COOLED REACTOR, by Chester A. Bielawski, Edward A. Douglas, and John G. Theodore. Final rept. on Contract AT(04-3)-187. June 60, 50p.

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Knolls Atomic Power Lab., Schenectady, N. Y.
REACTIVITY COEFFICIENTS IN THE UNPOISONED PMA-40 SLAB CORE. PART II - ANALYSIS, by James J. Schultheis. Rept. on Contract W-31-109-eng-52. Oct 61, 28p.

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Los Alamos Scientific Lab., N. Mex.
MANHATTAN DISTRICT HISTORY: PROJECT Y: THE LOS ALAMOS PROJECT, by Edith C. Truslow and Ralph Carlisle Smith. VOL. II, AUGUST 1945 THROUGH DECEMBER 1946. Rept. on Contract W-7405-eng-36. Dec 61, 244p.

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MONTHLY PROGRESS REPORT FOR APRIL, 1961, by J. F. Eichelberger. Rept. on Contract AT(33-1)-GEN-53. Aug 61, 14p.

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Nuclear Metals, Inc., Concord, Mass.
WOUND AND FOLDED SINGLE-SHEET FUEL ELEMENTS, by R. G. Jenkins, E. F. Jordan and others. Final technical rept. 1 July 60-30 June 61, on Contract AT(30-1)-1565. Aug 61, 80p.

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DAMAGE TO STAINLESS STEEL FUEL IN SPERT REACTORS, by R. E. Heffner. Rept. on Contract AT(10-1)-205. Nov 61, 22p.

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Savannah River Lab., Aiken, S. C.
STRESS RELAXATION IN ZIRCALOY-2 DURING IRRADIATION AT LESS THAN 100°C, by J. Walter Joseph, Jr. Rept. on Contract AT(07-2)-1. Oct 61, 21p.

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INFORMAL PROGRESS REPORT, Sep 61. 7p.

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United Nuclear Corp., White Plains, N. Y.
CONCEPTUAL DESIGN AND ECONOMIC EVALUATION OF A STEAM-COOLED FAST BREEDER REACTOR, by G. Sofer, R. Hankel and others. Rept. on Contract AT(30-1)-2303(XII). Nov 61, 181p.

Nuclear Reactions

UCRL-9507 $2.00

Lawrence Radiation Lab., U. of California, Berkeley.
ELASTIC SCATTERING OF PI MESONS ON PROTONS IN THE ENERGY REGION 550 TO 1020 Mev, by Calvin D. Wood. Rept. on Contract W-7405-eng-48. Oct 61, 79p.

UCRL-9886 $1.00

Lawrence Radiation Lab., U. of California, Berkeley.
THE PION-PION CROSS SECTION BY THE CHEW-LOW METHOD, by D. Duane Carmony. Rept. on Contract W-7405-eng-48. Oct 61, 43p.

LA-2643 $2.50

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THE NEUTRON-INDUCED DISINTEGRATION OF Li^6 AND Li^7 BY 5- TO 14-MEV INCIDENT NEUTRONS, by Louis Rosen and Leona Stewart. Rept. on Contract W-7405-eng-36. Dec 61, 117p.

LAMS-2543 $1.75

Los Alamos Scientific Lab., N. Mex.
SIX AND SIXTEEN GROUP CROSS SECTIONS FOR FAST AND INTERMEDIATE CRITICAL ASSEMBLIES, by Gordon E. Hansen and William H. Roach. Rept. on Contract W-7405-eng-36. Dec 61, 72p.

Radioactivity

PB 159 391 $3.60

General Dynamics/Fort Worth, Tex.
SPATIAL DISTRIBUTION OF NEUTRONS BEYOND A STRAIGHT CYLINDRICAL DUCT THROUGH A SHIELD, by J. W. Neuberger and R. L. Johnston. Rept. on Contract AF 33(600)32054. 15 Jan 57, 31p. 6 refs. NARF-57-1T; MR-N-137.

DESCRIPTORS: *Neutrons, Neutron beams, Attenuation, Shielding, Intensity, Scattering, Ducts.

In the design of experiments using neutrons which issue from a reactor beam hole, it is important to know the spatial distribution of these neutrons beyond the biological shield. In this report, a method for obtaining this distribution suitable for high-speed electronic computation is described together with results obtained on Convair-Fort Worth's IBM-704. In this method, the intensity at the field point is assumed to consist of the unscattered neutron beam and a scattered component arising from internal scattering in a straight cylindrical duct through the shield. The problem is discussed using a general source distribution function and then specialized to the case of a plane cosine source distribution for particular collimating systems. (Author)

TID-13832 $1.10

Goodyear Atomic Corp., Portsmouth, Ohio.
SUMMARY OF THE ENVIRONMENTAL RADIATION LEVELS AND CONCENTRATIONS. Rept. on Contract AT(33-2)-1. Jan 61, 9p.

TID-13833 $1.60

Goodyear Atomic Corp., Portsmouth, Ohio.
SUMMARY OF THE ENVIRONMENTAL RADIATION LEVELS AND CONCENTRATIONS. Rept. on Contract AT(33-2)-1. Apr 61, 11p.

GA-2229 $1.75

General Atomic Div., General Dynamics Corp., San Diego, Calif.
IRRADIATION EFFECTS ON THE SURFACE REACTIONS OF METALS, by W. L. Kosiba. Final rept. 15 Jan 58-15 Jan 61, on Contract AT(04-3)-179. July 61, 70p.

HW-68832 $1.10

Hanford Atomic Products Operation, Richland, Wash.
THE EFFECT OF EDTA ADDITION ON REACTOR EFFLUENT RADIOACTIVITY, by W. B. Silker. Rept. on Contract AT(45-1)-1350. Mar 61, 5p.

HW-71203 $0.75

Hanford Atomic Products Operation, Richland, Wash.
EVALUATION OF RADIOLOGICAL CONDITIONS IN THE VICINITY OF HANFORD, ed. by I. C. Nelson. Rept. July-Sep 61, on Contract AT(45-1)-1350. 22p.

NYO-9529 $3.60

Isotopes, Inc., Westwood, N. J.
STUDIES OF NUCLEAR DEBRIS IN PRECIPITATION, by Alan Walton. Progress rept. on Contract AT(30-1)-2415. Jan 61, 39p.

Waste Disposal

HW-71374 $1.00

Hanford Atomic Products Operation, Richland, Wash.
RESEARCH AND DEVELOPMENT ACTIVITIES: FIXATION OF RADIOACTIVE RESIDUES, by E. R. Irish. Quarterly progress rept. July-Sep 61, on Contract AT(45-1)-1350. Oct 61, 38p.

ORNL-TM-49 $5.60

Oak Ridge National Lab., Tenn.
WASTE TREATMENT AND DISPOSAL, by R. E. Blanco and E. G. Struxness. Progress rept. Aug-Sep 61. Nov 61, 57p.

IDO-14566 $0.50

Phillips Petroleum Co., Idaho Falls.
CONTAINMENT OF IODINE-131 RELEASED BY THE RALA PROCESS, by G. K. Cederberg and D. K. MacQueen. Rept. on Contract AT(10-1)-205. Oct 61, 27p.

PERSONNEL SUPPLIES AND PERSONAL EQUIPMENT

PB 155 286 $1.60

Air Crew Equipment Lab., Naval Air Material Center, Philadelphia, Pa.
PHYSIOLOGICAL EVALUATION OF THERMAL UNDERWEAR WORN WITH PROTECTIVE AIRCREW ASSEMBLIES UNDER EXTREME ENVIRONMENTAL CONDITIONS, by L. J. SantaMaria. Rept. on Test and Evaluation of Open Weave Underwear Proj. TED NAM AE-51153.2. 15 Feb 61, 13p. 3 refs. Rept. no. NAMC-ACEL-446; AD-251 850.

DESCRIPTORS: *Underwear, Physiology, Tests, Thermal insulation, Stress (Physiology), Attenuation.

Open-weave underwear was tested and evaluated as a component in survival suit systems in the alleviation of the effects of thermal stress. The underwear was worn with the MK4 Full Pressure Suit and the MK4, MK5, and MK6 Anti-Exposure Suits under environmental conditions giving rise to heat and cold stress. Measurements of skin and rectal temperatures and evaporative and total weight loss were made on a group of subjects, each serving as his own control. From the results of this investigation, no advantage was found in using this underwear, as compared to the standard long underwear, lightweight cotton or winter-weight cotton-wool, currently used in warm or cold environmental conditions, respectively. (Author)

OTS SB-482 $0.10

Office of Technical Services, Dept. of Commerce, Washington, D. C.
PROTECTIVE CLOTHING AND OTHER APPAREL. Oct 61, 12p. 154 refs. OTS Selective Bibliography SB-482.

DESCRIPTORS: *Protective clothing, Clothing, Exposure suits, Pressure suits, *Bibliography.

Lists 154 foreign and domestic references added to the OTS collection during the period 1950 to October 1961. Reports cover research on cold weather clothing, pressure suits, anthropometry, standards for knit underwear, thermal insulation, acid and radiation resistant clothing, laboratory clothing and the like.

PHYSICS

ANL-6432 $2.60

Argonne National Lab., Ill.
PHYSICS DIVISION. Summary rept. Sep-Oct 61, on Contract W-31-109-eng-38. 31p.

TID-13075 $1.50

Atomic Energy Commission. Div. of Licensing and Regulation, Washington, D. C.
THE PULSE DISTRIBUTIONS IN STILBENE PRODUCED BY 1-15 MEV NEUTRONS, CORRECTED FOR END EFFECT, by Allen Brodsky. June 61, 68p.

BNL-682(AS-15) $2.75

Brookhaven National Lab., Upton, N. Y.
ANNUAL REPORT, July 1961. 172p.

GA-2503 $2.00

General Atomic Div., General Dynamics Corp., San Diego, Calif.
DIFFERENTIAL NEUTRON THERMALIZATION, by W. L. Whittemore and A. W. McReynolds. Annual summary rept. 1 Oct 60-30 Sep 61, on Contract AT(04-3)-167. Oct 61, 94p.

KAPL-M-GHM-6 $8.10

Knolls Atomic Power Lab., Schenectady, N. Y.
DESCRIPTION AND ANALYSIS OF SOME "OVER-MODERATED" CRITICAL EXPERIMENTS FROM 68 - 550°F, by G. H. Miley and R. D. Gillespie. Rept. on Contract W-31-109-eng-52. Aug 61, 88p.

KAPL-M-GHM-7 $6.60

Knolls Atomic Power Lab., Schenectady, N. Y.
DESCRIPTION AND ANALYSIS OF SOME RELATIVELY LARGE, LOW $\beta\gamma$ CRITICAL EXPERIMENTS WITH SEMI-DISTRIBUTED BORON STRIPS FROM 68-550°F, by G. H. Miley, B. Miller. Rept. on Contract W-31-109-eng-52. Aug 61, 69p.

AD-263 096 $2.60 Not announced by ASTIA

Materials Research Lab., Watertown Arsenal, Mass
COMPTON INCOHERENT SCATTERING FUNCTIONS FOR IONS OF THE FIRST TRANSITION SERIES, by A. J. Freeman and R. E. Watson. Aug 61, 22p. 27 refs. MRL rept. no. 100.

DESCRIPTORS: *Transition elements, X rays, Scattering, Electrons, Ionization, Ions, Functions, Atomic orbitals, Quantum mechanics, Mathematical analysis, Scandium, Titanium, Vanadium, Chromium, Manganese, Iron, Cobalt, Nickel, Copper.

Compton incoherent scattering functions have been found for the transition elements Sc through Cu using the complete Waller-Hartree theory including the effects of the non-sphericity of the charge distributions. These calculations were based on analytic Hartree-Fock wave functions recently determined by Watson but restricted to $3d^n$ configurations. Results are given for three states of ionization (+1, +2, and +3) for each of the elements; the configurations $3d^n$ differ from the ground state only for the +1 ions other than Cr and Cu. These values are also compared with the few available earlier calculations for these ions and the role of the neglected 4s electrons is discussed. (Author)

AD-263 093 $1.60

Materials Research Lab., Watertown Arsenal, Mass.
CONTRIBUTION OF CORE POLARIZATION TO THE EFFECTIVE FIELD AT THE NUCLEUS IN FERROMAGNETS, by A. J. Freeman and R. E. Watson. Nov 60, 11p. 10 refs. MRL rept. no. 91.

DESCRIPTORS: *Ferromagnetic materials, Iron compounds, Nickel compounds, *Ferrites, Ferrite cores, Magnetic cores, Polarization, Magnetic fields, Magnetic properties, Magnetism, Ferromagnetism, Electrons, Density, Quantum mechanics, Nuclei, Nuclear spins, Atomic orbitals, Mathematical analysis.

Results are reported for a set of exchange polarized calculations of the core contribution to the magnetic field, H_C, at the nucleus in ferromagnets. A model consistent with neutron diffraction and energy band results was used. H_C was investigated as a function of the positions of the 3d density in the atom. (Author)

PB 155 231 $9.10

Naval Supersonic Lab., Mass. Inst. of Tech., Cambridge.
MEASUREMENT OF FLUCTUATIONS IN RADIATION FROM A SOURCE IN THERMAL EQUILIBRIUM, by Martin Harwit. Doctoral thesis. Rept. on Contracts Nonr-1841(40), DA 36-039-sc-78108, and National Science Foundation Grant G-9930. June 60, 108p. 59 refs. Technical rept. 364; AD-246 390.

DESCRIPTORS: Quantum mechanics, *Photons, Statistical analysis, Detectors, Lead compounds, Sulfides, *Thermal radiation, Measurement, *Infrared radiation, *Infrared detectors, *Photomultipliers

The Bose-Einstein classical or beat frequency fluctuation in a stream of photons from a source in thermodynamic equilibrium is measured, and the Einstein-Fowler equation of statistical thermodynamics is verified. By quantum statistical means, the fluctuation in the stream of radiation incident on a detector from a source at temperature, T, is determined. The amount of cross-correlation expected for the output current of two detectors illuminated by this source is derived. The theory of the intensity interferometer, based on an electromagnetic formulation is reproduced, and the results are compared to the quantum statistical results in the region of common applicability. The two theories are found to concur. The infrared spectral region is inherently optimum for speed in intensity interferometry, but a microwave maser system may be competitive with the best available infrared detectors. The system constructed to detect the sought fluctuations uses cooled lead sulfide detectors and is capable of detecting signals with signal-to-noise ratios of 3% in about 20 min integration times. The results of the photon fluctuation experiments are reported. An indication of the reliability of the entire set of measurements is the final signal-to-noise ratio of all measurements taken together. This is 3.9. (Author)

MATT-Q-15 $1.00

Plasma Physics Lab., Princeton U., N. J.
QUARTERLY REPORT, 1 APRIL-30 JUNE 61, on Contract AT(30-1)-1238. Aug 61, 35p.

K-1493 $0.50

Union Carbide Nuclear Co., Oak Ridge, Tenn.
VISCOUS FLOW THROUGH POROUS MEDIA, by Stephen Prager. Rept. on Contract W-7405-eng-26. Dec 61, 17p.

Acoustics

PB 156 098 $1.60

Marine Lab., U. of Miami, Coral Gables, Fla.
SOME GEOLOGICAL RESULTS OF UNDERWATER SOUND MEASUREMENTS IN THE BAHAMAS, by Thomas R. Goedicke. Technical rept. on Contract Nonr-840(01). May 60, 18p. 10 refs. Rept. 60-3; ML-61033; ML-8825.

DESCRIPTORS: *Underwater sound transmission, Measurement, Explosions, TNT, *Echo ranging, Recording devices, Hydrophones, Bahama Islands, Seismic waves, Ocean bottom, Depth indicators, *Geological survey, *Underwater sound.

A series of underwater sound transmission experiments were carried out in the Tongue of the Ocean, Bahamas. A vertical hydrophone array extending from the surface to 600 ft was used to pick up direct sound waves and echoes from 4 and 1/2 pound TNT charges detonated at different depths. The sound impulses were recorded on magnetic tape, the impulses from the different hydrophones being recorded simultaneously on different tracks. The distance from the shot points to the hydrophone array varied from 520 to 840 yd. A total of 60 shots were recorded at depths varying from 50 to 4000 ft. These shots were made at 6 stations, spaced at intervals of 5 naut mi along 3

traverses across the Tongue of the Ocean. All of the records showed sub-bottom echoes. The deepest reflections observed showed arrival times of over 1 sec from the time of the sea-floor echo. This indicates a sedimentary section to an approximate depth of 10 to 12,000 ft beneath the Tongue of the Ocean. (Author)

PB 157 514 $2.60

Marine Lab., U. of Miami, Coral Gables, Fla.
ULTRASONIC VELOCITY AND ABSORPTION MEASUREMENTS, by Joseph D. Richard. Final rept. on Contract Nonr-840(05). Oct 60, 26p. 24 refs. ML 61015; AD-253 488.

DESCRIPTORS: *Ultrasonic properties, Plants, *Ultrasonic radiation, *Ultrasonics, Water, Underwater sound transmission, Solutions, *Underwater sound, Absorption, Velocity, Aquatic animals.

Sound velocity measurements were made of water, chemical solutions, and particulate suspensions. Velocity and absorption measurements of suspensions of biological material up to 0.25 gram/liter were attempted but no differences could be observed compared to water alone. Some estimates were made of the effects which plankton might have on the propagation of underwater sound from the data of earlier investigators working with other biological material. It appears from this very limited experimental evidence that plankton in the ocean have an insignificant effect on the absorption and velocity of sound, as compared to the physical properties of the water itself. (Author)

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NAS 1.12:94

National Aeronautics and Space Administration, Washington, D. C.
SIMILARITY OF NEAR NOISE FIELDS OF SUBSONIC JETS, by Walton L. Howes. 1961, 54p. NASA Technical rept. R-94; AD-251 597.

DESCRIPTORS: *Jets, *Subsonic flow, *Jet engine noise, Pressure, Oscillation, Temperature, Noise

Similarity relations for frequency-pass-band, as well as overall, time-averaged pressure fluctuations outside a jet are derived and tested using experimental data. Similarity of the pressure fields was found for different jet velocities. Nozzle contour dissimilarity and differing jet temperatures were found to limit seriously the application of the similarity relations, especially near the jet nozzle. (Author)

Molecular Physics and Spectroscopy

AD-263 094 $1.60

Materials Research Lab., Watertown Arsenal, Mass.
ANALYTIC HARTREE-FOCK WAVE FUNCTIONS FOR THE 3p SHELL ATOMS, by R. E. Watson and A. J. Freeman. Mar 61, 18p. 32 refs. MRL rept. no. 94.

DESCRIPTORS: *Quantum mechanics, Atomic energy levels, *Atoms, Atomic orbitals, Aluminum, Silicon, Phosphorus, Sulfur, Chlorine, Argon, Chlorides.

Hartree-Fock wave functions have been obtained for the 3p row atoms, i.e., for neutral Al, Si, P, S, Cl, and A, and for Cl^-. Solutions were obtained in analytic form using a version of Nesbet's symmetry and equivalence restrictions to simplify the calculations for atoms with both closed and unclosed shells of the same ℓ value. These restrictions, the reason for their use, and their relation to other open shell methods are discussed and the calculated one-electron wave functions and their eigen-values are presented. (Author)

TID-13921 $1.60

Michigan U., Ann Arbor.
NEUTRON-CAPTURE GAMMA RAYS OF NATURAL COPPER, by P. A. Treado and P. R. Chagnon. 12p.

Order from GPO $3.00 as
C 13.44:32/pt. 2

National Bureau of Standards, Washington, D. C.
TABLES OF SPECTRAL-LINE INTENSITIES. PART II, ARRANGED BY WAVELENGTHS, by William F. Meggers, Charles H. Corliss, and Bourdon F. Scribner. 2 Oct 61, 272p. NBS Monograph 32, pt. II.

DESCRIPTORS: *Chemical elements, Spectrographic analysis, Tables, *Spectrographic data

The relative intensities, or radiant powers, of 39,000 spectral lines with wavelengths between 2000 and 9000 Angstroms have been determined on a uniform energy scale for seventy chemical elements. This was done by mixing 0.1 atomic percent of each element in powdered copper, pressing the powder-mixture to form solid electrodes which were burned in a 10 ampere, 220 volt direct-current arc, and photographing the spectra with a stigmatic concave grating while a step sector was rotating in front of the slit. The sectored spectrograms facilitated the estimation of intensities of all element lines relative to copper lines which were then calibrated on an energy scale provided by standardized lamps, and all estimated line intensities were finally adjusted to fit this calibration. Comparisons with other intensity measurements in individual spectra indicate that the National Bureau of Standards spectral-line intensities may have average errors of 20 percent, but first of all they provide uniform quantitative values for the seventy chemical elements commonly determined by spectrochemists. These data are presented by element in part I, and all 39,000 observed lines are given in order of wavelength in part II. (Author)

Optics

PB 154 387 $1.60

Duntley, S. Q., La Jolla, Calif.
AN ANALYSIS OF THE RELATIONSHIP BETWEEN OPTICAL ABBERATION AND VISUAL CONTRAST THRESHOLD, by James L. Harris. Rept. no. 5-2 on Contract NObs-72039. Dec 59, 19p. 6 refs. AD-231 557.
DESCRIPTORS: *Optical images, *Distortion, Mathematical analysis, *Visual thresholds, Integral transforms.

DeMott [J. Opt. Soc. Am. 49:6, 1959] reported direct measurements of the retinal image formed by excised steer and cat eyes. These measurements indicate the blur of the retinal image to be much greater than theoretically expected. DeMott implies that this imagery may also exist in the human eye. The present analysis assumes that the data on the excised steer eye do apply to the human eye. These data are used to find the flux on a central receptor from a circular uniformly illuminated target as a function of the diameter of the target. This function is then compared to the Tiffany data [J. Opt. Soc. Am. 36:624, 1946] which relate contrast threshold with angular subtense of circular uniform-luminance targets. (Author)

PB 156 238 $3.60

Electronic Systems Lab., Mass. Inst. of Tech., Cambridge.
A STUDY OF THE ENHANCEMENT OF THE KERR ROTATION, by Frank B. Cole. Rept. on Contracts AF 33(616)5489 and AF 33(616)5477. Apr 60, 34p. 21 refs. Technical memo. no. 7848-7849-TM-8; AD-242 253.

DESCRIPTORS: *Magneto optic rotation, Magnetic properties, Film readers, Films, *Data processing systems, *Optical systems, Dielectric films.

An experimental study of the Kerr magneto-optic effect and techniques of enhancement of this effect was made in an attempt to assess the possibility of utilizing this effect for magnetic film storage read-out. The average rotation observed on reflection from thin magnetic films was 0.015°. Interference techniques were used to increase this rotation by a factor of 5 to about 0.075°, although a factor of 13 appears possible. For a factor of 5, the change in light intensity caused by the Kerr Rotation is only 0.6% at best operating point. In order to detect such small changes, signal bandwidth must be restricted to 10^4 cps because of noise in the optical detector. In consideration of the noise problem, the Kerr rotation, even with enhancement, is still too small an effect to form the basis of a non-destructive read-out for use in a digital computer. (Author)

PB 159 164 $2.60

Naval Ordnance Lab., Corona, Calif.
PROPERTIES OF PHOTOCONDUCTIVE DETECTORS, by A. J. Cussen, A. B. Naugle, and V. R. Allen. Rept. no. 13 on Photoconductive Detector Series. June 55, 25p. 4 refs. NOL-Corona rept. 279.

DESCRIPTORS: *Infrared detectors, *Infrared photoconductors, Lead compounds, Sulfides, Selenides, Tellurides, Germanium, Physical properties.

The detectors described in this report were made in France. All of these are presently available commercially in France except the PbSe detectors. These will probably become available in the near future. The properties that have been measured are: (1) absolute spectral response; (2) response to a 500° K black body; (3) response to a square pulse of light from a new descharge source, designated the time constant; (4) frequency response; (5) noise spectrum; (6) variation of signal and noise with bias voltage; and (7) sensitivity contour.

PB 159 165 $5.60

Naval Ordnance Lab., Corona, Calif.
PROPERTIES OF PHOTOCONDUCTIVE DETECTORS, by A. B. Naugle, V. R. Allen, and A. J. Cussen. Rept. no. 24 on Photoconductive Detector Series. Nov 57, 53p. 4 refs. NAVORD rept. 4641; NOLC rept. 396; AD-157 302.

DESCRIPTORS: *Infrared detectors, *Infrared photoconductors, Lead compounds, Sulfides, Physical properties

Data sheets are presented which give various physical properties of photoconductive detectors. The detectors are commercially available lead sulfide cells made by the Electronics Corporation of America. (See also PB 159 164)

PB 159 166

Naval Ordnance Lab., Corona, Calif.
PROPERTIES OF PHOTOCONDUCTIVE DETECTORS, by A. B. Naugle, V. R. Allen, and A. J. Cussen. Rept. no. 25 on Photoconductive Detector Series. Dec 57, 43p. 14 refs. NAVORD rept. 4642; NOLC rept. 397; AD-157 303.

DESCRIPTORS: *Infrared detectors, *Infrared photoconductors, Lead compounds, Sulfides, Physical properties.

Data sheets are presented on the physical properties of room temperature lead sulfide photoconductive detectors made by the Infrared Industries. (See also PB 159 165)

PB 159 167 $6.60

Naval Ordnance Lab., Corona, Calif.
PROPERTIES OF PHOTOCONDUCTIVE DETECTORS, by A. B. Naugle, V. R. Allen, and A. J. Cussen. Rept. no. 28 on Photoconductive Detector Series. Dec 57, 61p. 14 refs. NAVORD rept. 4645; NOLC rept. 400; AD-160 285.

DESCRIPTORS: *Infrared detectors, *Infrared photoconductors, Lead compounds, Sulfides, Physical properties.

The detectors in this report are all room-temperature lead sulfide detectors made by Infrared Industries. (Author) (See also PB 159 166)

PB 159 168 $4.60

Naval Ordnance Lab., Corona, Calif.
PROPERTIES OF PHOTOCONDUCTIVE DETECTORS, by A. B. Naugle, V. R. Allen, and A. J. Cussen. Rept. no. 29 on Photoconductive Detector Series. Dec 57, 49p. 15 refs. NAVORD rept. 4646; NOLC rept. 401.

DESCRIPTORS: *Infrared detectors, *Infrared photoconductors, Lead compounds, Sulfides, Physical properties.

All the detectors in this report are room temperature, chemically deposited lead sulfide cells made by Eastman Kodak Company. (See also PB 159 167)

PB 159 169 $6.60

Naval Ordnance Lab., Corona, Calif.
PROPERTIES OF PHOTOCONDUCTIVE DETECTORS, by W. L. Eisenman and A. J. Cussen. Rept. no. 31 on Photoconductive Detector Series. Dec 57, 61p. 14 refs. NAVORD rept. 4649; NOLC rept. 404.

DESCRIPTORS: *Infrared detectors, *Infrared photoconductors, Cadmium compounds, Selenides, Selenium, Selenium compounds, Oxides, Physical properties.

This report includes data on European and domestic cadmium sulfide, cadmium selenide, and selenium-selenium oxide barrier layer cells. All the sensitivity and responsivity figures given are for measurements made at 90 cps. For most of these detectors an increase in responsivity would be realized by going to lower modulation frequencies but the sensitivity would not increase as much since the noise also goes up. Similarly, in many instances the sensitivity holds up quite well at higher frequencies, in spite of the long time constants, because of the attendant decrease in noise. (See also PB 159 168)

PB 159 170 $3.60

Naval Ordnance Lab., Corona, Calif.
PROPERTIES OF PHOTOCONDUCTIVE DETECTORS, by A. B. Naugle, V. R. Allen, and A. J. Cussen. Rept. no. 32 on Photoconductive Detector Series. Dec 57, 39p. 15 refs. NAVORD rept. 5914; NOLC rept. 405.

DESCRIPTORS: *Infrared detectors, *Infrared photoconductors, Lead compounds, Sulfides, Physical properties

This report consists of data sheets on 14 Eastman Kodak Company lead sulfide detectors which were operated at room temperature. (See also PB 159 169)

PB 159 171 $3.60

Naval Ordnance Lab., Corona, Calif.
PROPERTIES OF PHOTODETECTORS, by J. M. Pernett, A. B. Naugle and others. Rept. no. 39, 1 Dec 58-9 July 59, on Photodetector Series. 3 Dec 59, 39p. 3 refs. NAVORD rept. 5971; NOLC rept. 474; AD-233 960.

DESCRIPTORS: *Infrared detectors, *Infrared photoconductors, Lead compounds, Selenides, Physical properties

The results are presented of measurements made on 15 lead selenide detectors manufactured by the Eastman Kodak Co. Nine of the detectors are chemically deposited films and were measured at room temperature. The other six detectors are evaporated films and were measured at liquid-nitrogen temperature. A summary of the data obtained is provided. (Author) (See also PB 159 170)

PB 159 172 $3.60

Naval Ordnance Lab., Corona, Calif.
PROPERTIES OF PHOTODETECTORS, by W. L. Eisenman and A. B. Naugle. Rept. no. 44 Feb-June 60, on Photodetector Series. 29 Aug 60, 34p. 2 refs. NAVWEPS rept. 7151; NOLC rept. 527.

DESCRIPTORS: *Infrared detectors, *Infrared photoconductors, Lead compounds, Sulfides, Indium compounds, Antimonides, Germanium, Silicon, Alloys, Tellurium, Physical properties

This report presents the results of measurements made on twelve photodetectors. It includes data sheets on lead sulfide cells from Electronics Corporation of America and Infrared Industries, Inc.; an indium antimonide cell from Radiation Electronics Co.; a germanium-silicon alloy cell from Radio Corporation of America; and a tellurium cell from Minneapolis-Honeywell Research Center. A summary of the data obtained is given. Improved instrumentation was built and new procedures were established for the measurement of detector noise. It is believed that the new instrumentation provides a considerable improvement in the accuracy of the noise measurements. (Author)

AD-260 028 $2.60

Naval Ordnance Lab., Corona, Calif.
PROPERTIES OF PHOTODETECTORS, by W. L. Eisenman and A. B. Naugle. Rept. no. 45, Aug 60-Feb 61, on Photodetector Series. 1 June 61, 29p. 1 ref. NAVWEPS rept. 7181.

DESCRIPTORS: *Infrared detectors, *Infrared photoconductors, Indium compounds, Antimonides, Germanium, Lead compounds, Selenides, Sulfides, Physical properties

This report presents the results of measurements made on nine photodetectors. It includes data sheets on indium antimonide cells from Radiation Electronics Company and the Research Institute for National Defense; germanium cells from the Research Institute for National Defense and the Santa Barbara Research Center; lead selenide cells from the Santa Barbara Research Center and Infrared Industries, Inc.; and a lead sulfide cell from Infrared Industries, Inc. A summary of the data obtained is given. (Author) (See also PB 159 172)

AD-266 063 repriced $0.50

Naval Ordnance Test Station, China Lake, Calif.
A MEASUREMENT OF PROPELLER-MODULATED RADIATION FROM EIGHT DIFFERENT SMALL AIRCRAFT, by Joseph J. Adler. 21 July 60, 12p. Rept. no. IDP-954.

DESCRIPTORS: Airplanes, *Aerial propellers, Propeller turns, *Infrared radiation, Light, Modulation, Sky brightness, Signal-to-noise ratio, Detection, Measurement, Radiometers, Infrared detectors, Optical equipment, Harmonic analyzers, Test facilities, Aerial targets, Target recognition, Tests

Target-generated signals in the visible and infrared spectral regions were measured for a group of 10 different civilian aircraft. A ground-based, unchopped radiometer system was employed to obtain measurements of the target signals while the aircraft flew prearranged patterns above it. Subsequent analysis of the data yielded signal frequency and harmonic content information. Approximate acquisition ranges were computed from radar and target signal data. It was found that the range at which an airplane may be detected by an unchopped system depends upon the

type of background, time of day, type of aircraft and aspect angle. With the equipment used for these tests, the aircraft could easily be detected at ranges of from 10 to 20 thousand feet. (Author)

AD-266 306 repriced $1.25

Naval Ordnance Test Station, China Lake, Calif.
MEASUREMENTS OF THE INFRARED REFLECTING PROPERTIES OF BEADED SCREENS, by L. L. Collins and L. W. Nichols. 5 Apr 61, 50p. 1 ref. NOTS TP 2640.

DESCRIPTORS: *Infrared radiation, Reflection, *Reflectors, Radiometers

The reflecting properties of several beaded surfaces have been studied in the 0.3- to 6.0-micron spectral band. Quantitative results are shown for studies of spectral reflectance, effects of angle-of-incidence, and effects of range on radiation return. (Author)

PB 153 102 $12.00

Naval Supersonic Lab., Mass. Inst. of Tech., Cambridge.
THE PHYSICAL OPTICAL ANALYSIS AND APPLICATION OF THE SCHLIEREN INTERFEROMETER, by Edward B. Temple. Aug 59, 169p. 21 refs. Technical rept. 133; AD-247 917.

DESCRIPTORS: *Optical analysis, *Schlieren photography, *Interferometers, *Supersonic flow, Gases, Density, Measurement, Mathematical analysis.

By examining the wave optics descriptions of the schlieren system, it is shown that interference effects can result which are quantitatively related to the density in a gas. The schlieren system thus becomes equivalent to an interferometer. Criteria are given for dimensions of light source and other components which will produce the desired interference fringes. (Author)

TID-13170 $7.60

Picker X-Ray Corp., Cleveland, Ohio
A FINE FOCAL-SPOT X-RAY GENERATOR USING BETA-RAYS. Rept. on Contract AT(11-1)-746. Mar 61, 78p. Picker RR-61R5

PB 154 386 $1.60

Visibility Lab., U. of California, San Diego.
THE AXIOMATIC BASIS OF THE PRINCIPLES OF RADIATIVE TRANSFER THEORY, by Rudolph W. Preisendorfer. Rept. on Contract NObs-72092. Dec 59, 16p. 7 refs. SIO Reference 59-75, AD-231 551.

DESCRIPTORS: *Light, *Diffraction, Scattering, Mathematical analysis, Measure theory.

The formal completion of the basic mathematical structure of modern radiative transfer theory is presented. In addition to the basic equation of transfer for radiance, the 2 fundamental principles of the theory (namely the principles of invariance, and the principle of local interaction) are deducible from the 3 axioms C_1, M_1, R_1 previously discussed. These axioms comprise the root of the discipline of radiative transfer theory. (Author)

PB 154 384 $1.60

Visibility Lab., U. of California, San Diego.
MARKOV CHAINS AND RADIATIVE TRANSFER, by Rudolph W. Preisendorfer. Rept. on Contract NObs-72092. Dec 59, 17p. 9 refs. SIO Reference 59-72; AD-231 552.

DESCRIPTORS: *Probability, Statistical processes, *Light, Diffraction, Scattering.

Certain external aspects of discrete-space theory are discussed. The notions of discrete-space radiative transfer can be linked explicitly to a wide class of physical concepts which at first may be expected to lie outside its usual domain of ideas. This link is forged by demonstration that the key principle of discrete-space transfer theory, namely the local interaction principle, can be cast into a form which satisfies the axioms of a Markov chain. The set of ideas within the discrete space theory are explicitly given membership in the large class of physical processes which fall within the domain of Markov chains or stochastic processes. (Author)

PB 154 379 $1.10

Visibility Lab., U. of California, San Diego.
OPTICAL CONTRAST REDUCTION FACTORS FOR DOWNWARD LOOKING CASES, by Almerian R. Boileau. Rept. on Contract NObs-72092. Oct 59, 9p. 1 ref. SIO Reference 59-57; AD-231 553.

DESCRIPTORS: *Atmosphere, Illumination, *Visual perception, *Optics, *Light transmission, Mathematical analysis, *Optical images, *Visibility.

The optical image contrast reduction factor consists of two factors, viz., luminance ratio and atmospheric transmittance, both of which must be considered. In the case of the clear days in which measurements were made the luminance ratio was in the order of 25%, thereby causing the contrast reduction factor to be approximately 25% of the atmospheric transmittance. In the case of the murky day the measured luminance was the equilibrium luminance so that the luminance ratio was unity, but the atmospheric transmittance was low so that the contrast reduction factor was small. The mazimum contrast reduction factor for the vertical line of sight, looking downward from 20000 feet, was .175, while the minimum was .067. (Author)

PB 154 383 $3.60

Visibility Lab., U. of California, San Diego.
PLANE-SOURCE GENERATED LIGHT FIELDS IN DISCRETE SPACES, by Rudolph W. Preisendorfer. Rept. on Contract NObs-72092. Dec 59, 40p. 8 refs. SIO Reference 59-70; AD-231 554.

DESCRIPTORS: *Light, Diffusion, Scattering, Mathematical analysis, Theory.

Attention is directed to the problem of determining the light field generated by internal plane-sources in an

arbitrarily stratified plane-parallel medium. Using the methods of discrete-space theory established previously, a complete solution of the internal-source problem is developed. This solution is given in compact form. (Author)

PB 154 385 $2.60

Visibility Lab., U. of California, San Diego.
THE PRINCIPLES OF INVARIANCE FOR DIRECTLY OBSERVABLE IRRADIANCES IN PLANE-PARALLEL MEDIA, by Rudolph W. Preisendorfer. Rept. on Contract NObs-72092. Dec 59, 24p. 7 refs. SIO Reference 59-73; AD-231 555.

DESCRIPTORS: Water, Light transmission, *Light, Diffraction, Mathematical analysis, Differential equations.

The outline of the basic theory of directly observable irradiances in a plane-parallel medium X is completed by formally deriving the principles of invariance which govern these irradiances and their associated reflectance and transmittance functions over arbitrary subslabs of X. The derivations hold for a completely general plane-parallel medium setting. The medium is arbitrarily stratified with reflecting boundaries, and has a given set of external and internal source conditions. (Author)

PB 154 377 $2.60

Visibility Lab., U. of California, San Diego.
A PROOF OF THE ASYMPTOTIC RADIANCE HYPOTHESIS, by Rudolph W. Preisendorfer. Rept. on Contract NObs-72092. 1 Aug 58, 30p. 16 refs. SIO Reference 58-57; AD-206 114.

DESCRIPTORS: *Light, Scattering, *Optics, Neutron scattering, Diffusion, Reflection, Mathematical analysis.

The asymptotic radiance hypothesis may be stated as follows: The form of the angular distribution of light (radiance, specific intensity) about a point in an optical medium approaches, with increasing depth, a characteristic form which is independent of the external lighting conditions at the upper boundary of the medium and which depends only on the inherent optical properties of the medium. A proof of the hypothesis is given for a rather wide class of inhomogeneous spaces known as eventually separable spaces.

PB 154 382 $4.60

Visibility Lab., U. of California, San Diego.
RADIATIVE TRANSFER ON A LINEAR LATTICE, by Rudolph W. Preisendorfer. Rept. on Contract N NObs-72092. Nov 59, 50p. 7 refs. SIO Reference 59-67; AD-231 631.

DESCRIPTORS: Planetary atmospheres, Light transmission, *Light, Visibility, Lattices, Reflection

The 2-flow problem in a plane-parallel optical medium is studied by means of the tools of discrete-space radiative transfer theory. The end result is an explicit solution in the discrete-space context of the general 2-flow problem for an arbitrarily stratified source-free plane-parallel medium with arbitrary upper and lower boundary source conditions. (Author)

PB 154 378 $2.60

Visibility Lab., U. of California, San Diego.
SOME MATHEMATICAL ASPECTS OF GEOPHYSICAL OPTICS CONCEPTS, by Rudolph W. Preisendorfer. Rept. on Contract NObs-72092. 7 Aug 58, 21p. SIO Reference 58-58; AD-212 743.

DESCRIPTORS: *Optics, Geophysics, *Light, Scattering, Transmission, Mathematical analysis, Attenuation.

PB 154 381 $3.60

Visibility Lab., U. of California, San Diego.
THEORY OF POLARIZED LIGHT FIELDS IN DISCRETE SPACES, by Rudolph W. Preisendorfer. Rept. on Contract NObs-72092. Nov 59, 34p. 6 refs. SIO Reference 59-66; AD-231 628.

DESCRIPTORS: Water, Light transmission, *Light, *Diffraction, Visibility, Mathematical analysis, Vector analysis, Polarization.

The theory of radiative transfer on discrete spaces introduced in an earlier study is extended to include the phenomenon of polarized light. The study is divided into (1) a discussion of the phenomenological (or operational) definition of polarized light, (2) the casting of the principle of local interaction into polarized form. (Author)

Solid State Physics

PB 155 368 $2.60

Electron Device Lab , Ohio State U. Research Foundation, Columbus.
THE DIFFUSION OF BORON INTO SILICON THROUGH SILICON DIOXIDE FOR 0.1% SOURCE STRENGTH, by Joseph Cho Chuan Tsai and M. O. Thurston. Quarterly technical rept. no. 3, 1 July-30 Sep 59, on Contract DA 36-039-sc-83874. Nov 59, 21p. 3 refs. RF 896-3; AD-232 157.

DESCRIPTORS: *Semiconductors, *Silicon, Silicon compounds, Dioxides, Surfaces, *Boron, Diffusion, Oxidation, Impurities

The results for the surface concentration dependence on the diffusion temperature indicate that the surface concentration will be constant in the range from 1200°C to 1350°C. The bakeout time is about six and one-half hours for a fresh source material, even if the capsule which contains it has been used for a long time. The diffusivity of boron into silicon dioxide is higher than that of phosphorus in silicon dioxide under the same condition. Only one activation energy for D_1 of boron was observed. There was a similar relationship between the oxidation rate during diffusion and the surface concentration resulting from diffusion at a constant temperature as in phosphorus. A straight-line relationship between oxidation rate and the reciprocal of the diffusion temperature is observed when it

is plotted on the semilogarithm scale. Experimental results indicate that there is a slight snow-plow effect for boron. Evidence on oxide masking was observed. (Author)

TID-14181 $2.60

Institute of Metals and Explosives Research, U. of Utah, Salt Lake City.
CONDUCTIVITY OF THORIA POWDER IN CARBON DIOXIDE ATMOSPHERE, by Ralph M. Horton, Melvin A. Cook, and Milton E. Wadsworth. Technical rept. on Contract W-7405-eng-26. Oct 61, 28p.

UCRL-6594 $3.60

Lawrence Radiation Lab., U. of California, Livermore.
HALL EFFECT MEASUREMENTS, by Ross Kraft. A bibliography covering the period 1955-1961. Rept. on Contract W-7405-eng-48. Aug 61, 40p.

TID-14140 $8.10

Materials Science Center, Cornell U., Ithaca, N. Y.
LOW TEMPERATURE INTERNAL FRICTION IN PLASTICALLY DEFORMED MAGNESIUM, by Robert Tsang-Chu Tsui. Rept. on Contract AT(30-1)-2471. Sep 61, 89p.

PB 159 304 $7.60

Metals Research Lab., Brown U., Providence, R. I.
SOME ASPECTS OF THE ORIGIN OF DISLOCATIONS IN METAL CRYSTALS, by Stephen Howe and Charles Elbaum. Technical rept. on Contract Nonr-562(27). 1 Feb 61, 80p. 31 refs. AD-252 237.

DESCRIPTORS: *Metallic crystals, Single crystals, Microstructure, Lattices, X-ray diffraction analysis, Growth, Diffusion, Surface properties, Shear stresses, Thermal stresses, Mathematical analysis, Aluminum, Deformation, Dislocations

Single crystals of 99.999% pure and zone-refined Al were grown by the Czochralski method at rates of speed that varied from 0.4 to 5 mm/min. The axes of most of the crystals were parallel to a (110) direction. The crystals were carrot-shaped, about 4 cm long, tapering from a diameter of about 3mm at the top to about 0.1 mm at the bottom. X-ray diffraction micrographs were taken of the crystals by means of Lang's technique, which is capable of revealing the dislocation structure in the interior of a crystal. It was found that the density of dislocations present in an as-grown crystal increases with both increasing diameter and rate of growth. In some cases dislocations were only found on the surface of the crystals; these dislocations could be removed by careful electropolishing, thus producing crystals free of detectable dislocations. (Author)

PB 155 369 $1.60

Ohio State U. Research Foundation, Columbus.
THE SILICON OXIDATION MECHANISM IN THE DIFFUSION ATMOSPHERE, AND ANTIMONY DIFFUSION INTO SILICON THROUGH AN OXIDE LAYER, by M. O. Thurston and Joseph Tsai. Quarterly technical rept. no. 4, 1 Oct-31 Dec 59, on Research on Diffusion of Impurities into Silicon Through an Oxide Layer, Contract DA 36-039-sc-83874. 14 Jan 60, 17p. 7 refs. RF 896-4; AD-233 865.

DESCRIPTORS: *Semiconductors, *Silicon, Oxidation, Impurities, *Antimony, Phosphorus, Diffusion, Oxides, Thin films, Surfaces, Temperature.

An oxidation mechanism which is explained in terms of the diffusion of phosphorus into silicon through an oxide layer is proposed. This mechanism explains the correspondence of oxidation rate and surface concentration observed and the increase of the oxidation rate with source strength. Experimental data on the diffusion of antimony in a closed silica box indicate that no bakeout time is needed. Two activation energies for D_1 were observed, and the oxide masking effects is not pronounced. The surface concentration dependence on temperature, the diffusion time, and the oxidation rate versus temperature were obtained. (Author)

PB 155 943 $1.60

Ohio State U. Research Foundation, Columbus.
STUDIES CONCERNING THE OXIDATION OF SILICON, by M. O. Thurston, K. T. Pratinidhi and others. Quarterly technical rept. no. 7, 1 July-30 Sep 60, on Diffusion of Impurities into Silicon Through an Oxide Layer, Contract DA 36-039-sc-83874. 31 Oct 60, 20p. 12 refs. RF 896-7; AD-253 644.

DESCRIPTORS: *Silicon, Thin films, Oxidation, Temperature, Oxides, Energy, Diffusion, Impurities, *Transistors, Measurement, Surfaces, *Semiconductors.

The literature on the oxidation of silicon is briefly summarized, and methods of measurement of thin oxide films are compared. Experimental results are presented for the oxidation of silicon in dry air at temperatures from 800 to 1300°C and in very wet air at temperatures from 1100 to 1300°C. Apparent activation energies of 1.2 ev for dry air and 1.1 ev for wet air were observed. The difference between the two activation energies is comparable to the experimental error and may not be significant. (Author)

PB 158 119 $1.10

Oklahoma U. Research Inst., Norman.
THE INFLUENCE OF SOLID STATE DISLOCATIONS UPON CATALYTIC ACTIVITY OF METALS, by T. D. Perkins, C. M. Sliepcevich, and W. R. Upthegrove. Technical rept. no. 1 on Contract Nonr-982(08). 15 Nov 60, 5p. 10 refs. AD-246 383.

DESCRIPTORS: *Metals, Silver, *Single crystals, *Catalysis, Catalysts, *Metallic crystals, Formic acids, Decomposition, Crystal structures, Surfaces, Lattices, *Silver catalysts.

The purpose of this research is to relate quantitatively the catalytic activity of metals with dislocation densities by measuring the influence of dislocation density upon the activity of Ag single crystals used to catalyze the decomposition of formic acid. Oriented single crystals of Ag (3 1/2 x 1 1/8 x 1/8 in.) were

grown by the horizontal growth techniques of Chalmers (The Defect Solid State, Interscience Publishers, Inc., 1957). Limited success was achieved with the equipment; severe lineage structures were produced in most crystals. Removal of effects of seed cutting and handling by electrochemical polishing proved very satisfactory and will be used to prepare reproducible surfaces for the catalyst crystals. A technique was evolved for determining the true surface area of the metallic single crystal.

Theoretical Physics

NYO-9496 $2.60

Institute of Mathematical Sciences, New York U., N. Y.
CONTAINMENT IN CUSPED PLASMA SYSTEMS, by Harold Grad. Rept. on Contract AT(30-1)-1480. Mar 61, 24p. (MF-15)

UCRL-9777 $2.75

Lawrence Radiation Lab., U. of California, Livermore and Berkeley.
CONTROLLED THERMONUCLEAR RESEARCH. Quarterly rept. Mar-June 61, on Contract W-7405-eng-48. Aug 61, 157p.

Thermodynamics

Order from GPO $0.20 as I 28.3:596

Bureau of Mines, Washington, D. C.
THE CHEMICAL THERMODYNAMIC PROPERTIES OF HYDROCARBONS AND RELATED SUBSTANCES. THE USE OF n-HEPTANE AS A REFERENCE SUBSTANCE FOR LOW-TEMPERATURE CALORIMETRY, by John P. McCullough and John F. Messerly. 1961, 15p. Bulletin 596.

DESCRIPTORS: *Hydrocarbons, *Heptanes, Chemical properties, *Thermodynamics, *Calorimetry, Low temperature research.

This bulletin presents the results obtained for n-heptane. Detailed results of five investigations are given; selected values of the low-temperature thermal properties are tabulated; and comparisons with results that were obtained in other laboratories are made. The findings of this extensive study will serve to characterize the low-temperature thermal data for over 100 compounds that will be presented in a later bulletin of this series. (Author)

Order from GPO $0.15 as I 28.23:5858

Bureau of Mines, Washington, D. C.
HEATS AND FREE ENERGIES OF FORMATION OF OXIDES OF VANADIUM, by Alla D. Mah and K. K. Kelley. 1961, 11p. Rept. of Investigations 5858.

DESCRIPTORS: *Vanadium compounds, *Oxides, *Heat of formation, Entropy, Combustion, Energy.

This report presents new heat-of-formation data for four oxides of vanadium (VO, V_2O_3, VO_2, and V_2O_5), obtained by combustion calorimetry. It is believed that the uncertainties have been reduced to 0.1 to 0.3 kilocalorie per gram-atom of contained oxygen. The new heat-of-formation data were combined with existing entropy and high-temperature heat-content values to obtain free energies of formation of the four oxides at temperatures up to 2,000° K. (Author)

PB 159 229 $2.60

Cryogenic Lab., Ohio State U. Research Foundation, Columbus.
COEFFICIENTS OF THERMAL EXPANSION OF SOLIDS AT LOW TEMPERATURES. I. THE THERMAL EXPANSION OF COPPER FROM 15° TO 300°K, by Thor Rubin, H. W. Altman, and H. L. Johnston. Technical rept. no. 11 on Liquid Hydrogen as an Aircraft Fuel, Contract W 33-038-ac-14794(16243). [1951] declassified 6 Apr 54, 27p. 17 refs. TR 264-11, ATI-111 187.

DESCRIPTORS: Solids, *Copper, *Thermal expansion, Measurement, Temperature, Low temperature research, *Cryogenics, Interferometers, Liquified gases, Hydrogen, Aviation fuels, Fuels

An apparatus for measuring the thermal expansion of solids over the temperature range 15°-300° K by a differential method making use of a Fizeau interferometer is described. Experimental data for copper are presented and are applied to the Grüneisen relations.

PB 159 230 $5.60

Fuels Research Lab., Mass. Inst. of Tech., Cambridge.
LABORATORY SOURCES OF HIGH INTENSITY THERMAL RADIATION, by Curtis Williams, III. Rept. on Contract N5ori-07851. 7 May 51, declassified 5 Nov 53. 51p. 27 refs. ATI-205 776.

DESCRIPTORS: *Thermal radiation, Sources, Laboratory equipment, Design, Laboratory furnaces

This report includes: (1) an estimation of the various source characteristics required; (2) a discussion of several general considerations pertinent to the behavior of more than one class of sources; (3) a description of each of the sources which have been used or are readily available; and (4) an evaluation of these sources in terms of the criteria.

UCRL-13016 $1.50

Georgia Inst. of Tech. Engineering Experiment Station, Altanta.
THE EFFECTS OF RESONANT VIBRATIONS ON HEAT TRANSFER AT HIGH REYNOLDS NUMBERS, by Thomas W. Jackson, Calvin C. Oliver, and Ian Eastwood. Final rept. 13 June-13 Aug 61. Dec 61, 58p.

UCRL-9744 $3.00

Lawrence Radiation Lab., U. of California, Berkeley.
DOWNFLOW FORCED-CONVECTION BOILING OF WATER IN UNIFORMLY HEATED TUBES, by Roger Maurice Wright. Rept. on Contract W-7405-eng-48. Aug 61, 215p.

TID-14281 $3.60

Michigan U., Ann Arbor.
THERMAL PROPERTIES BASED UPON HEAT CAPACITY AND DECOMPOSITION PRESSURE OF TETRAMETHYLAMMONIUM HYDROGEN DICHLORIDE. THE NATURE OF THE HYDROGEN BOND IN THE $(Cl\text{-}H\text{-}Cl)^-$ ION, by Shu-Sing Chang and Edgar F. Westrum, Jr. 33p.

AD-265 417 repriced $0.50

Naval Ordnance Lab., White Oak, Md.
A METHOD FOR THE RAPID NUMERICAL SOLUTION OF THE HEAT CONDUCTION EQUATIONS FOR ENERGY ABSORBED BY A SEMI-INFINITE SOLID HEATED BY A VARYING SURFACE TEMPERATURE AT x=0, by John D. Ferguson. Rept. on Applied Research on Ignition Materials. 1 Mar 61, 16p. 7 refs. NAVWEPS 7397.

DESCRIPTORS: Numerical analysis, *Thermal conductivity, Equations, Energy, *Solids, Heat transfer, *Surface temperatures, Tables, Diffusion, Functions, Integrals, Partial differential equations, Polynomials, Difference equations.

A rapid numerical scheme is presented for obtaining the energy absorbed per unit of area, q, through the surface of a semi-infinite solid, where the surface temperature is given as a function of time. A simple numerical scheme is used to evaluate the integral which defines q in terms of the surface temperature. Average values of the surface temperature are used in each time interval of the grid which partitions the time axis. This method eliminates the necessity of computing the rate at which energy is transferred to the solid and/or the interior temperatures of the solid. (Author)

PB 155 907 $11.00

Naval Supersonic Lab., Mass. Inst. of Tech., Cambridge.
HEAT TRANSFER RATES AND INSULATED WALL TEMPERATURES FOR A TRANSPIRATION COOLED HEMISPHERE, by Albert F. Gollnick, Jr. Rept. on Contract AF 49(638)245. Dec 60, 143p. 29 refs. Technical rept. 433; DSR 8180; AFOSR-TN-60-1483.

DESCRIPTORS: *Blunt bodies, *Heat transfer, *Boundary layer, Cooling, *Aerodynamic heating, Countermeasures, Thermodynamics, *Coolants, Air, Helium Model tests, Wind tunnel models, Reduction, Absorption, Supersonic flow, Porosity, Disks, Wedges, Ablation, Thermal diffusion.

Existing solutions to the boundary layer equations with helium injection and constant free stream pressure gradient are used to calculate the injection distribution on a hemisphere required to maintain a constant wall temperature. The method used is an extension of the wedge-matching technique of Stine and Wanlass. The fabrication and calibration of a wind tunnel model designed on this basis is described. The model was tested at Mach 3.53. The resulting distributions of wall temperature, insulated wall temperature and Stanton number are presented, and the variation of these quantities with injection rate, using air and helium as coolants. The Stanton numbers obtained with air and helium agree with theoretical predictions, and the corresponding heat fluxes demonstrate that mass transfer cooling on a blunt body is very effective. On the other hand, the anticipated superiority of helium over air does not occur, since the adverse effect of helium injection on the insulated wall temperature negates the corresponding reduction in heat transfer coefficient. (Author)

TID-13485 $1.50

Nuclear Tech. Lab., Stanford U., Calif.
HEAT TRANSFER AND PRESSURE DROP FOR A GAS AT HIGH TEMPERATURE, by Monty E. Davenport, Patrick M. Magee, and George Leppert. Rept. on Contract AT(04-3)-247. May 61, 59p.

TID-13678 $4.60

Wisconsin U., Madison.
PROPERTIES OF MATERIALS AT HIGH TEMPERATURES, by John L. Margrave. Technical progress rept. 16 Oct 60-15 Oct 61, on Contract AT(11-1)-835. Sep 61, 42p.

Wave Propagation

PB 158 664 $5.60

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
EFFECTS OF TRANSMISSION-PATH PARAMETERS ON METEOR-TRAIL PROPAGATION, by T. D. Shockley and W. B. Jones. Technical rept. no. 5 on Contract Nonr-991(02). 15 Dec 60, 58p. 6 refs. AD-250 180.

DESCRIPTORS: *Radio transmission, *Radio signals, Propagation, *Radio communication systems, Meteors, Reflection, *Radio waves, Analysis, Wave transmission.

The use of meteor trails as reflectors for electromagnetic waves provides a technique for the transmission and reception of radio messages beyond the horizon. A number of loci, computed by a high-speed digital computer, are presented. Each represents the locus of all points in the meteor trail zone at which the trails due to a single meteor radiant are properly oriented to produce reflections. Meteor activity for selected intervals along the loci is expressed in terms of a relative measure of effectiveness factor F sub g. This effectiveness factor is quite general insofar as meteor activity is concerned since the properties of the transmitting and receiving antennas are not included in the computations. Path parameters studied are the direct station-to station path length and the radiant azimuth and zenith angles. General trends in the variations of the shapes of the loci and the sensitivity factor are established for a number of representative cases. In addition the basic precepts of a technique for sketching additional loci through the utilization of the computed data are introduced. (Author)

PB 158 094 $4.60

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
METEOR SHOWER STUDIES USING FORWARD SCATTER VHF RADIO, by J. B. Berry, Jr. Technical rept. no. 4 on Contract Nonr-991(02). Nov 60, 45p. 4 refs. AD-249 559.

DESCRIPTORS: *Meteors, Radio interference, *Radio waves, Very high frequency, Scattering, Measurement, *Position finding, Radio communication systems, Detection.

Forward scatter radio techniques were used to study 5 meteor showers. The results are presented in the form of plots of counting rate as a function of time. The minimum detectable meteor size was eighth magnitude for the Geminid shower and somewhat fainter for the other showers. A digital computer program was utilized to plan and evaluate the results of these experiments. (Author)

PB 155 507 $4.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
THE ART OF FORMULATING SIGNAL FLOW GRAPHS, by L. Braun, Jr. and W. A. Lynch. Rept. on Contract DA 30-069-ORD-2346. 18 Oct 60, 46p. 4 refs. Research rept. PIBMRI-869-60; AROD-2208: 2-E; AD-252 691.

DESCRIPTORS: *Electrical networks, Algebra, *Electronic circuits, Equations, *Radio signals, Mathematical analysis, Integral transforms.

Research is presented on the formulation of flow graphs. Several different formulation techniques which have been found useful are described and illustrated. In discussing formulation philosophies, the authors emphasize the art aspect of formulation since the guaranteed methods which always yield a correct graph do not always lead to a useful one. The necessity for departing from conventional thinking in order to visualize a graph especially suited to achieving a desired viewpoint is not the least of the flow graph's virtues. The further necessity for developing a casual point of view in graph formulation places the analyst in a position of advantage when he is dealing with feedback systems. Enough background is presented for the understanding of the properties of flow graph symbolism as well as the essential operations of flow-graph algebra. Formulation techniques are presented which originate from sets of simultaneous algebraic equations, sets of integro-differential equations (their Laplace transforms actually) and directly from circuit models. Areas are indicated in which the signal-flow-graph approach may have important advantages over conventional techniques in the analysis and design of systems--and especially feedback systems. (Author)

PB 161 619 $0.75

National Bureau of Standards, Boulder, Colo.
A NOTE ON THE PROPAGATION OF CERTAIN LF PULSES UTILIZED IN A RADIO NAVIGATION SYSTEM, by J. R. Johler. 27 Oct 61, 28p. 16 refs. Technical note no. 118.

DESCRIPTORS: Low frequency, *Radio waves, Propagation, *Radio navigation, *Radio equipment, Loran, Synthesis.

Low frequency pulses utilized in a radio navigation system can be synthesized and analyzed by a specialization of the general theory of pulse propagation. The analysis technique required to accomplish such a research is detailed, and the introduction of receiver and detector circuits into such an analysis is described. The time-difference dispersion correction, or the "discrepancy correction," for operation of a radio navigation pulse system on either the ground-wave time mode or the ionospheric time modes of propagation is defined. (Author)

PB 151 377-11 $1.50

National Bureau of Standards, Boulder, Colo.
QUARTERLY RADIO NOISE DATA JUNE, JULY, AUGUST 1961, by W. Q. Crichlow, R. T. Disney, and M. A. Jenkins. 16 Nov 61, 65p. 11 refs. NBS Technical note no. 18-11.

DESCRIPTORS: *Noise (Radio), Measurement, Tables

See also PB 151 377-10

PB 161 598 $1.50

National Bureau of Standards, Boulder, Colo.
TECHNIQUES FOR COMPUTING REFRACTION OF RADIO WAVES IN THE TROPOSPHERE, by E. J. Dutton and G. D. Thayer. 17 Oct 61, 70p. 13 refs. Technical note no. 97.

DESCRIPTORS: Atmosphere, *Radio waves, *Atmospheric refraction, Refraction, Refractive index, Numerical methods and procedures, Wave propagation.

Eight methods of computing atmospheric refraction of radio rays are discussed with appropriate theoretical background. These methods are: (1) The high-angle, or astronomical, refraction case; (2) The statistical method; (3) The low-angle, or terrestrial, refraction case (Schulkin's method); (4) The four-thirds earth model; (5) The exponential model; (6) The initial gradient correction method; (7) The departures-from-normal method; and (8) A graphical method (Weisbrod's and Anderson's method). Sample computations are included for each of the methods.

PB 161 618 $0.75

National Bureau of Standards, Boulder, Colo.
VARIATIONS IN FREQUENCY OF OCCURRENCE OF SPORADIC E, 1949-1959, by W. B. Chadwick. Oct 61, 26p. 12 refs. Technical note no. 117.

DESCRIPTORS: *Ionosphere, *Ionospheric propagation, *Atmospheric sounding, Sunspots, Electromagnetic effects, Radio waves, Propagation.

The question of the dependence of sporadic E on the sunspot cycle has largely been unresolved, with many investigators obtaining conflicting answers. In this report results are given covering daily-hourly values of fEs for eleven years at three ionosphere sounding stations, College, Washington, and Huancayo, chosen as representative of the three main sporadic-E zones.

These stations experienced a minimum of equipment changes and changes of location during this period. Scaling procedures were monitored over the eleven years by a data quality-control group at the National Bureau of Standards. The period included the highest average sunspot number for over 200 years.

PB 157 522 $5.60

Purdue U. School of Aeronautical and Engineering Sciences, Lafayette, Ind.
REFLECTION OF ELASTIC WAVES FROM THE WAVY BOUNDARY OF A HALF-SPACE, by John W. Dunkin and A. Cemal Eringen. Technical rept. no. 17 on Contract Nonr-1100(02). Oct 60, 55p. 4 refs. AD-249 666.

DESCRIPTORS: *Wave transmission, Surfaces, Surface properties, Physical properties, Elasticity, Reflection, Fourier analysis, Perturbation theory.

The reflection of elastic waves from a free or fixed, wavy boundary of an elastic half plane is investigated by means of a small perturbation method applied to the Fourier transforms of the displacement potentials. For both the free and the fixed sinusoidal boundary the zero perturbation solution yields just the waves reflected from the flat boundary while the first perturbation solution contains two waves for each wave in the zero perturbation. For certain ratios of wave length of the incoming wave to surface corrugation wave length, the first perturbation reflected waves become surface waves with speeds different from that of Rayleigh waves. In the free boundary case these surface waves can resonate while for the fixed boundary no resonance occurs. The free boundary results are modified to yield the solution to the problem of the scattering of a Rayleigh surface wave by a wavy surface. (Author)

RESEARCH METHODS, TECHNIQUES AND EQUIPMENT

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Science and Technology Div., Library of Congress, Washington, D. C.
MAINLAND CHINA: ORGANIZATIONS OF HIGHER LEARNING IN SCIENCE AND TECHNOLOGY AND THEIR PUBLICATIONS. A SELECTED GUIDE, comp. by Chi Wang. 1961, 104p.

DESCRIPTORS: *Scientific organizations, Universities, Libraries, Science, Medicine, Agriculture, China, Periodicals

The guide, which is designed to serve librarians, scientists, educators, and government officials, is intended to identify and describe scientific organizations and publications of Mainland China. With the increase in importance of science and technology in Mainland China during the past decade, there have been a number of publications, chiefly in the Chinese and Japanese Languages, which list and describe Mainland Chinese research organizations, societies, and universities. Despite these efforts, it appeared desirable to provide, in English, a single, comprehensive list that would include the titles of publications. The guide includes: (1) learned societies; (2) universities and colleges; (3) Academia Sinica and affiliated research institutes; (4) China Academy of Medical Sciences, and branch institutes; (5) Chinese Academy of Agricultural Sciences, and branch institutes; (6) governmental research organizations, and (7) libraries. The following information is supplied for each entry, if available: (1) official name of the organization in romanized transcription; (2) official name in Chinese characters; (3) official name in English translation as used on publications (in parentheses when supplied by compiler); (4) location or address; (5) founding date; (6) officials; (7) research activities and facilities, and (8) principal publications.

SOCIAL SCIENCES

PB 158 093 $1.60

Institute for Quantitative Research in Economics and Management, Purdue U., Lafayette, Ind.
ADMISSIBILITY AND MEASURABLE UTILITY FUNCTIONS, by James P. Quirk and Rubin Saposnik. Rept. on Contract Nonr-1100(16). Nov 60, 12p. 4 refs. Institute Paper no. 10; AD-249 999.

DESCRIPTORS: *Measure theory, Probability, Statistical functions, *Economic conditions, Functions.

In applying measurable utility theory to the problem of choices among probability distributions of income, it is natural to require that the preference orderings satisfy the relation: more income (with certainty) preferred to less income (with certainty). This condition is shown to imply a corresponding admissibility criterion, as applied to measurable utility functions over probability distributions of income. Admissibility bears a striking resemblance to the admissibility criterion of minimax theory. Some probability distributions must be ruled out on a priori grounds, before optimization is carried out. (Author)

PB 158 566 $7.60

Institute for Quantitative Research in Economics and Management, Purdue U., Lafayette, Ind.
ALLOCATING INDIVISIBLE RESOURCES AFFORDING EXTERNAL ECONOMIES OR DISECONOMIES, by Stanley Reiter and Gordon R. Sherman. Rept. on Contract Nonr-1100(16). Dec 60, 78p. 6 refs. Institute Paper no. 11; AD-250 815.

DESCRIPTORS: Distribution theory, *Economics, *Operations research, Management engineering, Industrial procurement.

Progress on an important class of problems in economics depends on development of methods of efficiently allocating indivisible resources, particularly in the presence of external economies or diseconomies. This class of problems is also of great interest in connection with the study of economic organization. The theorem stating that the price system leads to an optimal allocation of resources fails when external economies are present. Knowledge of a method of allocating such resources efficiently would contribute to understanding of economic organization. There is

one unit of each of a number of resources to be allocated, as well as a finite number of alternative uses to which each resource might be put (several resources may be put to the same use, but each resource unit to just one use). The external relations among resources take the form of bilateral interactions, i.e., the performance (productivity, profit, or other measure of pay-off) of each resource depends on the total allocation through direct interaction with each of the resources with which it is grouped. The problem may be stated more concretely as that of locating factories in cities, in circumstances in which the output of each factory depends on which other factories are located in the same city. The resulting mathematical problem is that of maximizing (minimizing) a certain set-function over a certain class of partitions of a finite set. (Author)

PB 158 092 $3.60

Institute for Quantitative Research in Economics and Management, Purdue U., Lafayette, Ind.
DISTRIBUTIONS OF CORRELATION COEFFICIENTS IN ECONOMIC TIME SERIES, by Edward Ames and Stanley Reiter. Rept. on Contract Nonr-1100(16). Nov 60, 30p. 14 refs. Institute Paper no. 8; AD-249 998

DESCRIPTORS: *Economics, *Statistical functions, Distribution, Statistical analysis, Probability, *Functional analysis, Functions.

Frequency distributions are presented of coefficients of correlation and auto-correlation computed from annual economic data. It was felt that these provide a more appropriate basis for tests of significance of correlations among economic variables than does the distribution of the correlation coefficient under the usual null hypothesis of statistical theory that the expected correlation is zero. (Author)

PB 155 961 $4.60

Remington Rand Univac Div., Sperry Rand Corp. [Philadelphia, Pa.]
OPTIMIZATION AND STANDARDIZATION OF INFORMATION RETRIEVAL LANGUAGE AND SYSTEMS, by Claire K. Schultz, Alan Brooks, and Phyllis Schwartz. Technical status rept. no. 1 on Contract AF 49(638)835. 15 Jan [61] 50 p. 7 refs. AFOSR-213.

DESCRIPTORS: *Documentation, *Indexes, Preparation, Data storage systems, *Digital computers, Computers, Language, Standarization, Symposia, Scheduling,

Progress is reported on experimental work with ASTIA data, author's indexing, and scheduling meetings by means of a computer. Included are two papers: A generalized computer method for information retrieval, and The 1960 Federation Meeting; scheduling a meeting and preparing an index by computer.

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